SEW EURODRIVE

Manual

UHX71B Controller (Performance Class power) with OSR71B Fieldbus Interface (EtherNet/IP, Modbus/TCP and PROFINET)

Edition 04/2013

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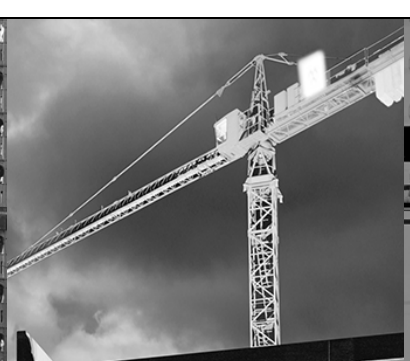


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Contents

1 General information

1.1 How to use this documentation

The documentation is an integral part of the product and contains important information on operation and service. The documentation is written for all employees who assemble, install, start up, and service this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes, warnings regarding potential risks of damage to property, and other notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent danger	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the drive system or its environment
INFORMATION	Useful information or tip: Simplifies the handling of the drive system.	

1.2.2 Structure of the section safety notes

Section safety notes do not apply to a specific action but to several actions pertaining to one subject. The symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a section safety note:

⚠ SIGNAL WORD

Type and source of danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.2.3 Structure of the embedded safety notes

Embedded safety notes are directly integrated in the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Type and source of danger.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the danger.

1.3 Rights to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Therefore read the documentation before you start working with the unit.

1.4 Content of the documentation

This document contains additional safety-related information and conditions for operation in safety-related applications.

1.5 Exclusion of liability

You must comply with the information contained in this documentation to ensure safe operation and to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

1.6 Other applicable documentation

Observe the following applicable documents:

- "Controller UHX71B (performance class power)" manual
- "MOVI-PLC® Programming in the PLC Editor" manual

The following publications and documents apply to the connected units:

- Operating instructions of the units

  (Units are, for example, MOVIDRIVE® B, MOVITRAC® B, MOVIAXIS®)
- For units with functional safety technology, also the respective

  "Functional Safety" manuals

Make sure you always use the latest documentation.

Our documentation is available in various languages for download from the SEW homepage (www.sew-eurodrive.com). If you are unclear about any of the information in this documentation or if you require further information, consult SEW-EURODRIVE.

If required, you can order printed copies of the documentation from SEW-EURODRIVE.

1.7 Product names and trademarks

All product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.8 Copyright

2 Safety Notes

2.1 General information

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and adhered to.

Ensure that persons responsible for the machinery and its operation as well as persons who work independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, please contact SEW-EURODRIVE.

The following safety notes refer to the use of the software. Also adhere to the supplementary safety notes in this document and in the documentation of the connected devices from SEW-EURODRIVE.

This document does not replace the detailed documentation of the connected devices. This document assumes that the user has access to and is familiar with the documentation for all connected devices from SEW-EURODRIVE.

Never install or start up damaged products. Submit a complaint to the shipping company immediately in the event of damage.

During operation, the devices may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces depending on their degree of protection.

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property. Refer to the documentation for additional information.

2.2 Target group

Any work with the software may only be performed by adequately qualified personnel. Qualified personnel in this context are persons who have the following qualifications:

- Appropriate instruction.
- Knowledge of this documentation and other applicable documentation.
- SEW-EURODRIVE recommends additional product training for products that are operated using this software.

Any mechanical work on connected units may only be performed by adequately qualified personnel. Qualified personnel in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.

Any electrical work on connected units may only be performed by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.
- Knowledge of the relevant safety regulations and laws.
- Knowledge of the other standards, guidelines, and laws mentioned in this documentation.

The above mentioned persons must have the authorization expressly issued by the company to operate, program, configure, label and ground units, systems and circuits in accordance with the standards of safety technology.

All work in further areas of transportation, storage, operation and waste disposal must only be carried out by persons who are trained appropriately.

2.3 Bus systems

A bus system makes it is possible to adapt frequency inverters and/or motor starters to the specific conditions of the machinery within wide limits. This results in the risk that a change of parameters that cannot be detected externally can result in unexpected, though not uncontrolled, system behavior.

2.4 Functional safety technology

The inverters and servo drives controlled by the SEW controller may not execute any safety functions without higher-level safety systems unless they are described in the relevant documentation and expressly approved.

Use higher-level safety systems to ensure protection of equipment and personnel.

2.5 Hoist applications

MOVIDRIVE® B, MOVITRAC® B, MOVIAXIS®, MOVIPRO® and MOVIFIT® must not be used as a safety device in hoist applications.

Use monitoring systems or mechanical protection devices as safety equipment to avoid possible damage to property or injury to people.

3 Introduction

3.1 Content of this manual

This user manual illustrates:

- Startup of the UHX71B-OSR71B controller on the fieldbus systems EtherNet/IP, Modbus/TCP and PROFINET IO.
- The configuration of the EtherNet/IP master with EDS files.
- The configuration of the Modbus/TCP master.
- The configuration of the PROFINET master using GSDML files.

The creation of IEC programs or the connection of SEW drives to the system bus interfaces of the controller is not described.

3.2 Characteristics

Due to its powerful universal fieldbus interfaces, the UHX71B-OSR71B controller allows for the connection to higher-level automation systems via EtherNet/IP, Modbus/TCP and PROFINET IO.

3.2.1 Process data exchange

Via the PROFIBUS interface, the UHX71B-OSR71B controller provides digital access to a special data section the IEC 61131-3 evaluates as process input and output data to a higher-level controller. The meaning of the transferred data depends on the IEC program.

3.2.2 Parameter access

The UHX71B-OSR71B controller does not support the MOVILINK® parameter channel. The "MultiMotion" program provides a bus-dependent, cyclical parameter channel. For further information refer to the publication "MultiMotion for MOVI-PLC®".

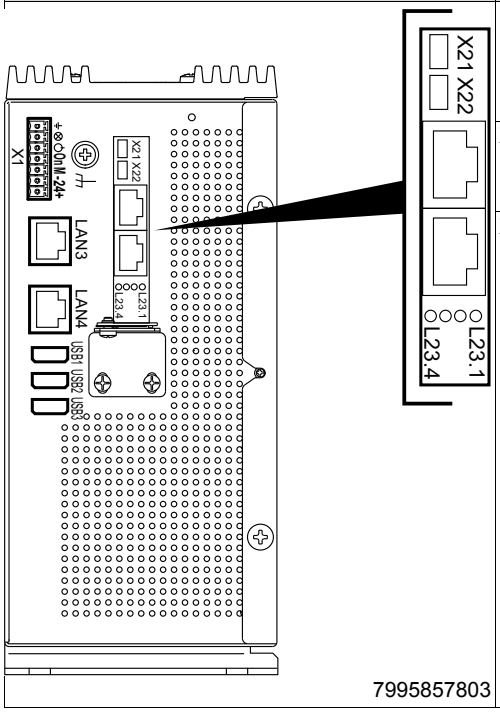
3.2.3 Monitoring functions

Using a fieldbus system requires additional monitoring functions, for example, time monitoring of the fieldbus (fieldbus timeout) or rapid stop concepts. For example, you can adapt the monitoring functions specifically to your application in the IEC program. You can determine, for instance, which error responses should be triggered in the event of a bus error. For many applications, a rapid stop function is useful. However, you can also freeze the last setpoints so that the drive continues to operate with the most recently valid setpoints. As the range of functions for the control terminals is also guaranteed in fieldbus mode, you can continue to implement rapid stop concepts using the terminals of the UHX71B-OSR71B controller, irrespective of the fieldbus used.

4 Assembly and Installation Notes for Ethernet

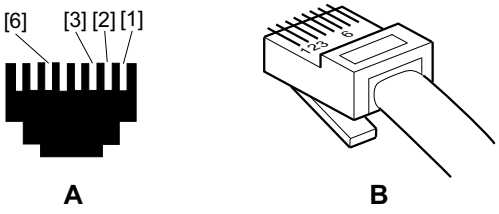
4.1 Connecting the UHX71B-OSR71B controller to an Ethernet network

This chapter only describes the connection to Ethernet networks via X21 and X22. Connection and functionality via X37 (engineering) are described in the "UHX71B (Performance Class power)" manual.

Front view UHX71B with OSR71B (Ethernet)	Designation	LED Terminal	Function
	**LED**	**LED 23.1** **LED 23.2** **LED 23.3** **LED 23.4**	Reserved Reserved Ethernet Communication status System status
	X21: Ethernet connection **LED Link (green)** **LED Activity (yellow)**		
	X22: Ethernet connection **LED Link (green)** **LED Activity (yellow)**		

4.2 Pin assignment X21 and X22

Use prefabricated, shielded RJ45 plug connectors compliant with IEC 11801, edition 2.0, category 5.



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A	View from front	B	View from back
[1]	Pin 1 TX+ Transmit Plus	[2]	Pin 2 TX– Transmit Minus
[3]	Pin 3 RX+ Receive Plus	[6]	Pin 6 RX– Receive Minus

4.2.1 Connection controller / Ethernet

To connect the UHX71B-OSR71B controller to the Ethernet network, connect the Ethernet interface X21 or X22 (RJ45 plug connector) to the other network stations using a category 5, class D twisted-pair cable in accordance with IEC 11801 edition 2.0. The integrated switch assists you in implementing a line topology and provides auto-crossing functions.

INFORMATION

- According to IEC 802.3, the maximum cable length for 10/100 MBaud Ethernet (10BaseT / 100BaseT), e.g. between 2 network stations, is 100 m.
- We recommend that you do not directly connect non-SEW end devices to the UHX71B-OSR71B controller in order to minimize the load on the end devices in EtherNet/IP networks caused by undesired multicast data traffic. Connect non-SEW devices via a network component that supports the IGMP snooping functionality (e.g. managed switch).

4.3 Shielding and routing bus cables

Only use shielded cables and connection elements that meet the requirements of category 5, class D according to IEC 11801 edition 2.0.

Correct shielding of the bus cable attenuates electrical interference that can occur in industrial environments. The following measures ensure the best possible shielding:

- Manually tighten the mounting screws on the connectors, modules, and equipotential bonding conductors.
- Use only connectors with a metal housing or a metalized housing.
- Connect the shielding in the connector over a wide surface area.
- Apply the shielding of the bus cable on both ends.
- Route signal and bus cables in separate cable ducts. Do not route them parallel to power cables (motor leads).
- Use metallic, grounded cable racks in industrial environments.
- Route the signal cable and the corresponding equipotential bonding close to each other using the shortest possible route.
- Avoid using plug connectors to extend bus cables.
- Route the bus cables closely along existing grounding surfaces.

INFORMATION

In case of fluctuations in the ground potential, a compensating current may flow via the bilaterally connected shield that is also connected to the protective earth (PE). Make sure you supply adequate equipotential bonding in accordance with relevant VDE regulations in such a case.

4.4 The integrated Ethernet switch

You can use the integrated Ethernet switch to achieve line topologies known from the fieldbus technology. Other bus topologies, such as star or tree, are also possible. Ring topologies are not supported.

INFORMATION

The number of industrial Ethernet switches connected in line impacts the telegram runtime. If a telegram passes through the units, the telegram runtime is delayed by the store & forward function of the Ethernet switch:

- For a telegram length of 64 bytes by approximately 10 µs (at 100 Mbit/s)
- For a telegram length of 1500 bytes by approximately 130 µs (at 100 Mbit/s)

This means the more units a telegram has to pass through, the higher the telegram runtime is.

4.4.1 Auto-crossing

The two ports leading out of the Ethernet switch have auto-crossing functionality. This means that they can use both patch and cross-over cables to connect to the next Ethernet node.

4.4.2 Auto-negotiation

The baud rate and duplex mode are negotiated by both Ethernet nodes when establishing the connection. For this purpose, both Ethernet ports of the EtherNet/IP connection support an auto-negotiation functionality and work with a baud rate of either 100 Mbit or 10 Mbit in full duplex or half-duplex mode.

4.4.3 Notes on multicast handling

- The integrated Ethernet switch does not provide a filter function for Ethernet multicast telegrams. Multicast telegrams that are usually sent in Ethernet/IP networks from the adapters (UHX71B-OSR71B controller) to the scanners (PLC) are passed on to all switch ports.
- IGMP Snooping (e.g. Managed Switches) is not supported.
- SEW-EURODRIVE therefore recommends to connect the UHX71B-OSR71B controller in EtherNet/IP networks only with network components that support IGMP snooping (e.g. managed switch) or that have safety mechanisms integrated against excess multicast load (e.g. units from SEW-EURODRIVE). Units that do not have this integrated function can fail due to high network loads.

4.5 Status LED

The LEDs of the UHX71B-OSR71B controller indicate the current status of the UFR41B option and the fieldbus system. Depending on the set protocol, the LEDs have the following meaning.

4.5.1 Status LED in EtherNet/IP operation

LED L23.2

The LED L23.2 (NETWORK STATUS) indicates the state of the fieldbus system.

State of LED 23.2	Meaning
Off	The UHX-OSR71B controller does not yet have any IP parameters.

State of LED 23.2	Meaning
Flashing green/red	The UHX-OSR71B performs a self test.
Flashing green	There is no controlling IO connection.
Green	There is a controlling EtherNet/IP connection.
Red	Conflict detected in the assigned IP addresses. Another station in the network uses the same IP address.
Flashing red	The previously established controlling IO connection is in timeout state. The state is reset by restarting communication.

LED L23.3

LED L23.3 (MODULE STATUS) indicates that the bus electronics are operating correctly.

State of LED 23.3	Meaning
Off	The UHX71B-OSR71B controller is either not supplied with voltage or it is faulty.
Flashing green	Device has not been configured yet and is in "Standby" state.
Flashing green/red	The UHX71B-OSR71B controller performs a self test.
Green	The UHX71B-OSR71B controller is in normal operating state.
Red	The UHX71B-OSR71B controller is in error state.
Flashing red	Conflict detected in the assigned IP addresses. Another station in the network uses the same IP address.

LED L23.4

LED 23.4 (SYS) indicates the proper functioning of the fieldbus electronics (hardware).

State of LED 23.4	Diagnostics	Troubleshooting
Green	The fieldbus hardware is OK.	-
Orange	Hardware is being initialized.	-

4.5.2 Status LED in PROFINET operation

LED L23.2

The LED L23.2 (BUS FAULT) shows the status of the PROFINET.

State of LED L23.2	Cause of error	Troubleshooting
Off	PROFINET IO device is currently exchanging data with the PROFINET IO controller (Data Exchange).	-
Flashing red at 2 Hz	No data exchange.	-
Red	• Connection to the PROFINET IO controller has failed. • PROFINET IO device does not detect a link. • Bus interruption • PROFINET IO controller is not in operation	• Check the PROFINET connection of the UHX71B-OSR71B controller • Check the PROFINET IO controller. • Check the cabling of your PROFINET network

LED L23.3

LED L23.3 (SYS FAULT) indicates that the bus electronics are operating correctly.

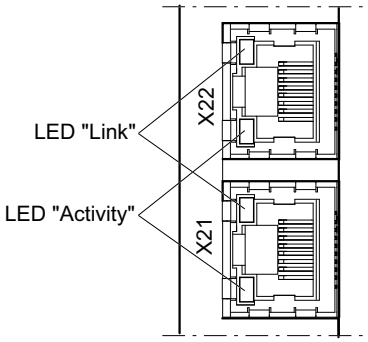
State of LED L23.3	Cause of error	Troubleshooting
Off	No error	Switch the unit on again. Consult SEW Service if the error occurs again.
Red	Error in the UHX71B-OSR71B controller hardware.	
Flashing red 2 Hz, for 3 s	DCP Signal Service is triggered via fieldbus. The flashing function in the PROFINET IO controller configuration is activated to visually localize the stations.	

LED L23.4 LED 23.4 (SYS) indicates the proper functioning of the fieldbus electronics (hardware).

State of LED 23.4	Diagnostics	Troubleshooting
Green	The fieldbus hardware is OK.	-
Orange	Hardware is being initialized.	-

4.5.3 Link/Activity LED

The two LEDs **Link (green)** and **Activity (yellow)** integrated in the RJ45 plug connectors (X21, X22) display the state of the Ethernet connection.



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LED/state	Meaning
Link/green	There is an Ethernet connection.
Link/off	There is no Ethernet connection.
Link/flashes	Locating function of SEW Address Editor (see chapter 4.8)
Activity/yellow	Data is currently being exchanged via Ethernet.

4.6 TCP/IP addressing and subnetworks

4.6.1 Introduction

The settings for the address of the IP protocol are made using the following parameters:

- MAC address
- IP address
- Subnet mask
- Standard gateway

The addressing mechanisms and subdivision of the IP networks into subnetworks are explained in this chapter to help you set the parameters correctly.

4.6.2 MAC address

The MAC address (Media Access Controller) is the basis for all address settings. The MAC address of an Ethernet device is a worldwide unique 6-byte value (48 bits). The MAC address of SEW Ethernet devices is 00-0F-69-xx-xx-xx. The MAC address is difficult to handle for larger networks. This is why freely assignable IP addresses are used.

4.6.3 IP address

The IP address is a 32-bit value that uniquely identifies a node in the network. An IP address is represented by 4 decimal numbers separated by decimal points.

Example: 192.168.10.4

Each decimal number stands for one byte (= 8 bits) of the address and can also be represented using binary code (see following table).

Byte 1		Byte 2		Byte 3		Byte 4
11000000	.	10101000	.	00001010	.	00000100

The IP address comprises a network address and a node address (→ following table).

Network address	Node address
192.168.10	4

The part of the IP address that denotes the network and the part that identifies the node is determined by the network class and the subnet mask.

Node addresses cannot consist of only zeros or ones (binary) because they represent the network itself or a broadcast address.

4.6.4 Network classes

The first byte of the IP address determines the network class and as such represents the division into network addresses and node addresses.

Value range Byte 1	Network class	Complete network address (Example)	Meaning
0 ... 127	A	101.22.3	10 = Network address 1.22.3 = Node address
128 ... 191	B	17216.52.4	172.16 = Network address 52.4 = Node address
192 ... 223	C	192.168.10.4	192.168.10 = Network address 4 = Node address

This rough division is not sufficient for a number of networks. They also use an explicit, adjustable subnet mask.

4.6.5 Subnet mask

A subnet mask is used to divide the network classes into even finer sections. Like the IP address, the subnet mask is represented by 4 decimal numbers separated by decimal points.

Example: 255,255,255,128

Each decimal number stands for one byte (= 8 bits) of the subnet mask and can also be represented using binary code (→ following table).

Byte 1		Byte 2		Byte 3		Byte 4
11111111	.	11111111	.	11111111	.	10000000

If you compare the IP addresses with the subnet masks, you see that in the binary representation of the subnet mask all ones determine the network address and all the zeros determine the station address (see following table).

		Byte 1		Byte 2		Byte 3		Byte 4
IP address	decimal	192	.	168.	.	10	.	129
	binary	11000000	.	10101000	.	00001010	.	10000001
Subnet mask	decimal	255	.	255	.	255	.	128
	binary	11111111	.	11111111	.	11111111	.	10000000

The class C network with the address 192.168.10. is further subdivided by the subnet mask 255.255.255.128. 2 networks are created with the address 192.168.10.0 and 192.168.10.128.

The following node addresses are permitted in the two networks:

- 192.168.10.1 ... 192.168.10,126
- 192.168.10,129 ... 192.168.10,254

The network nodes use a logical AND operation for the IP address and the subnet mask to determine whether there is a communication partner in the same network or in a different network. If the communication partner is in a different network, the standard gateway is addressed for passing on the data.

4.6.6 Standard gateway

The standard gateway is also addressed via a 32-bit address. The 32-bit address is represented by 4 decimal numbers separated by decimal points.

Example: 192.168.10.1

The standard gateway establishes a connection to other networks. In this way, a network station that wants to address another station can use a logical AND operation with the IP address and the subnet mask to determine whether the desired station is located in the same network. If this is not the case, the node addresses the standard gateway (router), which must be part of the actual network. The standard gateway then takes on the job of transmitting the data packages.

If for the standard gateway, the same address is set as for the IP address, the standard gateway is deactivated. The address of the standard gateway and the IP address must be in the same subnetwork.

4.6.7 DHCP (Dynamic Host Configuration Protocol)

Instead of setting the 3 parameters IP address, subnet mask and standard gateway manually, they can be assigned automatically by a DHCP server in the Ethernet network.

This means the IP address is assigned from a table, which contains the allocation of MAC address to IP address.

Parameter P785 indicates whether the UHX71B-OSR71B controller expects the IP parameters to be assigned manually or via DHCP.

4.7 Setting the IP address parameters

4.7.1 Initial startup

The "DHCP" protocol (**D**ynamic **H**ost **C**onfiguration **P**rotocol) is activated as the default setting for the UHX71B-OSR71B controller. This means that the option card expects its IP address parameters from a DHCP server.

INFORMATION

There is a free DHCP server available on the Rockwell Automation homepage. The tool is known as "BOOTP Utility" and can be downloaded from the following website: http://www.ab.com/networks/bootp.html.

Once the DHCP server has been configured and the settings have been made for the subnetwork screen and the standard gateway, the UHX71B-OSR71B controller must be inserted in the assignment list of the DHCP server. The MAC ID of the UHX71B-OSR71B controller is allocated a valid IP address.

INFORMATION

The configured IP address parameters are permanently adopted into the parameter set if DHCP is deactivated after the IP address has been assigned.

4.7.2 Changing the IP address parameters after successful initial startup

If the UHX71B-OSR71B controller was started using a valid IP address, you can also access the IP address parameters via the Ethernet interface.

You can change the IP address parameters via Ethernet by one of the following methods:

- with the MOVITOOLS® MotionStudio software via [Diagnose] / [File System Monitor]
- using the EtherNet/IP TCP/IP interface object (see chapter "EtherNet/IP CIP object directory")

If the IP address parameters are assigned to the UHX71B-OSR71B controller via DHCP server, then you can only change the parameters by adjusting the settings of the DHCP server.

The options listed above for changing the IP address parameters only come into effect once the supply voltages (DC 24 V) have been switched off and back on again.

4.7.3 Deactivating / activating the DHCP

The type of IP address assignment is determined by the setting of the attribute *Configuration Control* of the EtherNet/IP TCP/IP interface object. The value is displayed or changed in the parameter *P785 DHCP / Startup Configuration*.

- "Stored IP parameters" setting

  The stored IP address parameters are used.

- "DHCP" setting

  The IP address parameters are requested by a DHCP server.

  If you use the DHCP server from Rockwell Automation, you can activate or deactivate the DHCP by clicking a button. In this case, an EtherNet/IP telegram is sent to the TCP/IP interface object of the station that is being addressed.

4.8 Replacing the unit

- If DHCP is active, the assignment list of the DHCP server must be updated when the UHX71B-OSR71B is replaced. The MAC address of the UHX71B-OSR71B controller is printed on its front panel for this purpose.
- If DHCP is not active, the IP parameters saved on the memory card of the UHX71B-OSR71B controller will be used.

  If, after the UHX71B-OSR71B controller has been replaced, you do not plug the old memory card into the replacement unit, you will have to perform a complete startup with the new controller (if DHCP is not active incl. the IP parameters). Alternatively, you can transfer a data backup to the new unit created with the MOVITOOLS® MotionStudio software.

5 Configuration and Startup (EtherNet/IP)

This chapter provides information on the configuration of the EtherNet/IP master and startup of the UHX71B-OSR71B controller for fieldbus operation. Prerequisite is the correct connection and setting of the IP address parameters of the UHX71B-OSR71B controller in accordance with the chapter "Assembly and Installation Instructions".

5.1 Validity of the EDS file for UHX71B-OSR71B

INFORMATION

Do not edit or amend the entries in the EDS file. SEW assumes no liability for inverter malfunctions caused by a modified EDS file.

SEW-EURODRIVE provides the following EDS file for configuring the scanner (EtherNet/IP master):

- SEW_CONTROLLER_POWER.eds

INFORMATION

Current versions of the EDS files for the UHX71B-OSR71B option are available on the SEW homepage (http://www.sew-eurodrive.com) under the heading "Software".

5.2 Configuring the master (EtherNet/IP scanner)

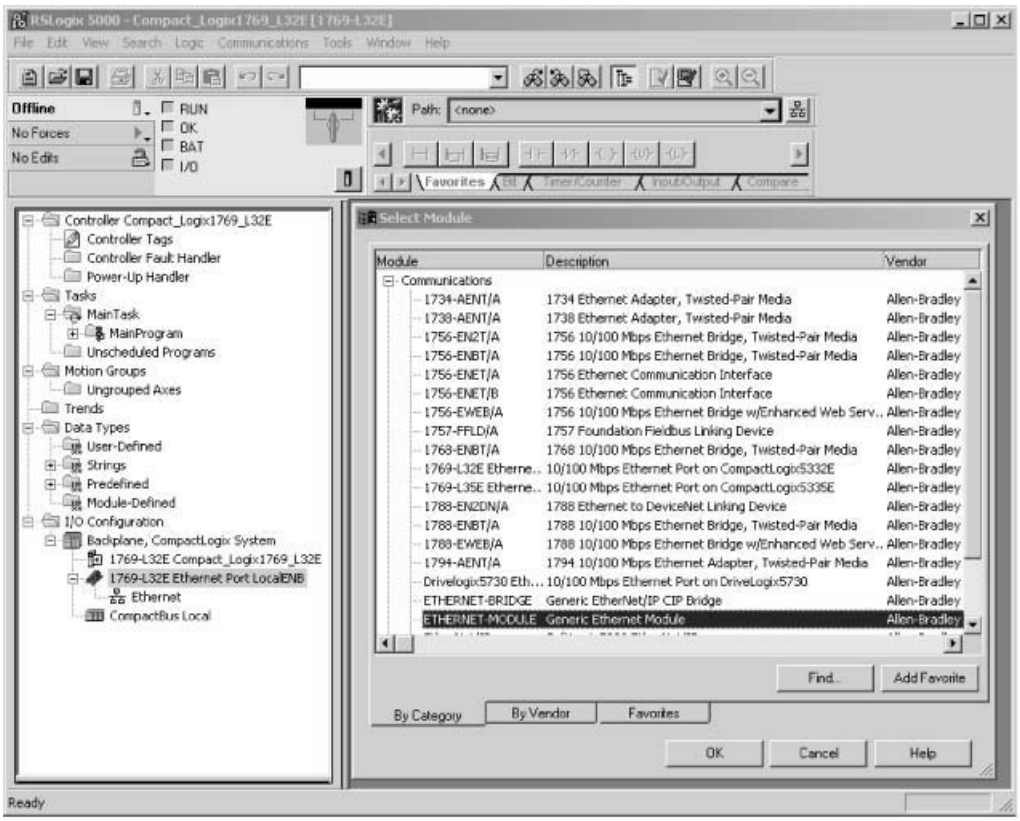
The following example refers to configuration for the Allen-Bradley CompactLogix 1769-L32E controller with RSLogix 5000 programming software. The EtherNet/IP interface is already integrated into the CPU component of this controller.

INFORMATION

If a CPU without an EtherNet/IP interface is used, an Ethernet communication interface must first be added to the I/O configuration.

5.2.1 Process data exchange

In the following project planning example, the UHX71B-OSR71B controller is added to a project. To do so, go to the “Controller Organizer” screen in the RSLogix 5000 program as shown in the screenshot below (use the tree structure on the left side of the screen).



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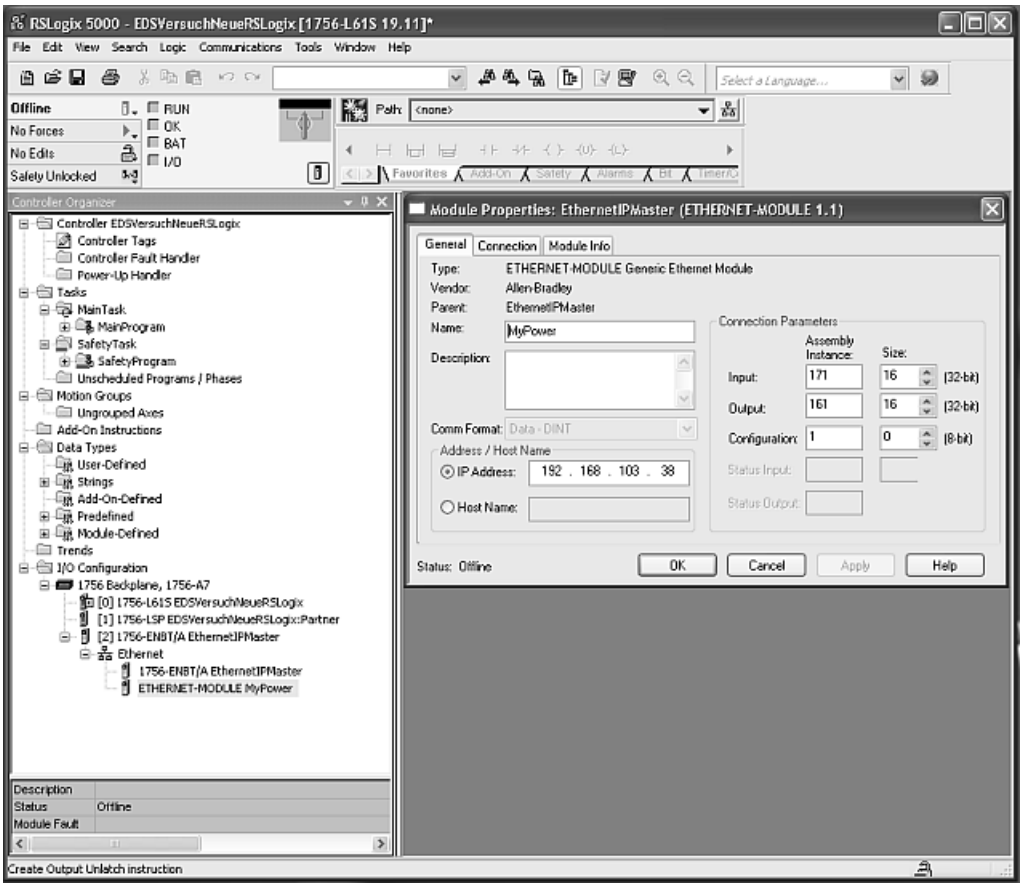
- In the "IO Configuration" folder, select the entry "1769-L32E Ethernet Port LocalENB" as the Ethernet communication interface. Right-click and choose "New Module" from the context menu. The selection window "Select Module" appears.
- To add option UHX71B-OSR71B to the project, mark the entry “ETHERNET MODULE” in the “Communications” category. Confirm your selection by clicking [OK].
- The "New Module" window opens.

First enter the name under which the data is stored in the controller tags for the newly created module, and then enter the IP address.



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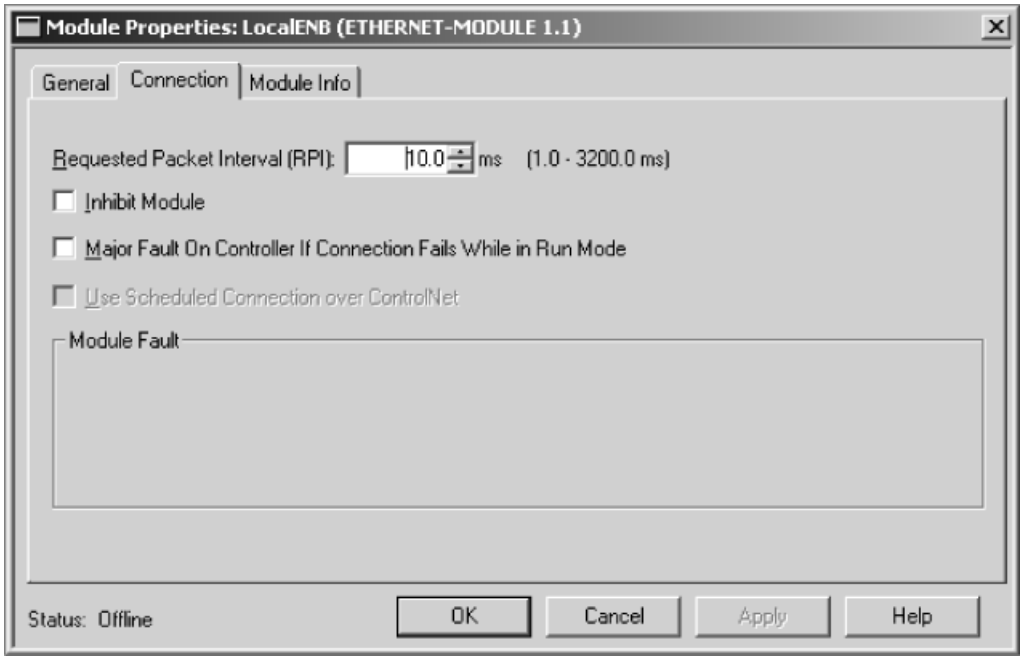
- **In the “Comm Format” dropdown menu, choose “Data - INT” as the data format. Process data for UHX71B-OSR71B always contains 16 bits (INT).**
- In the "Connection Parameters" group box, enter the value "171" in the "Input Assembly Instance" input field. The input data of the PLC must be linked to the output instance of UHX71B-OSR71B.
- To establish a controlling connection, in the "Connection Parameters" group box enter the value "161" in the "Output Assembly Instance" input field. The input data of the PLC must be linked to the output instance of UHX71B-OSR71B.
- In the selection fields "Input Size" and "Output Size", set a maximum value of "64" (16 bit) as the data length.
- In the "Configuration Size" selection field, enter the value "0". The "Configuration Assembly Instance" input field is not used in this case.
- Click [OK] to complete the process.
- To ensure compatibility with existing DeviceNet configurations, you can also choose the data type "SINT" in the "Comm Format" selection field. In this case, you must ensure that an even number of bytes (2 – 128) is configured and that data consistency is maintained during operation when the IO data is accessed.

5.2.2 Other settings

On the "Connection" tab page you can set the data rate and, if necessary, the error response of the controller.



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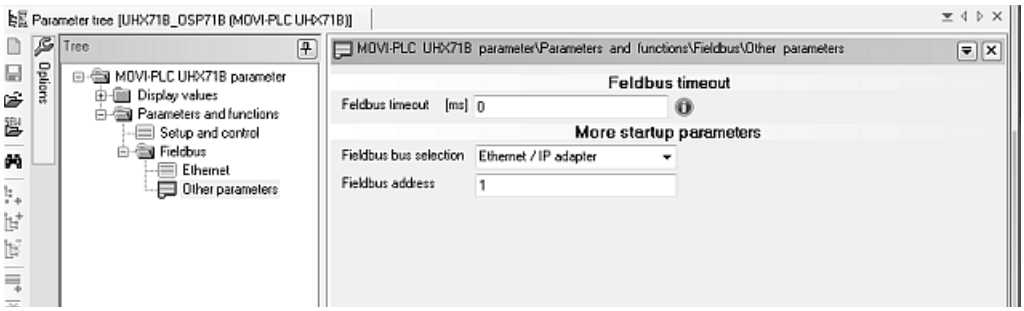
- The UHX71B-OSR71B controller supports a minimum data rate (input field "Requested Packet Interval (RPI)") of 4 ms. Longer cycle times can be implemented without any problems.
- Click [OK]. You have now configured process data exchange with a UHX71B-OSR71B.

5.3 Settings in the UHX71B-OSR71B controller

The creation of IEC programs is described in detail in the "MultiMotion for MOVI-PLC®" manual. This is why only the fieldbus-specific characteristics are described in this chapter.

5.3.1 Process data configuration Ethernet/IP slave and modbus/TCP

To activate the fieldbus interface, set the *Fieldbus selection* parameter in the parameter tree of MOVITOOLS® MotionStudio to the required bus type (Ethernet/IP or Modbus/TCP).



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In the "IP parameters" group box, enter the following addresses:

- IP address
- Subnet mask
- Standard gateway

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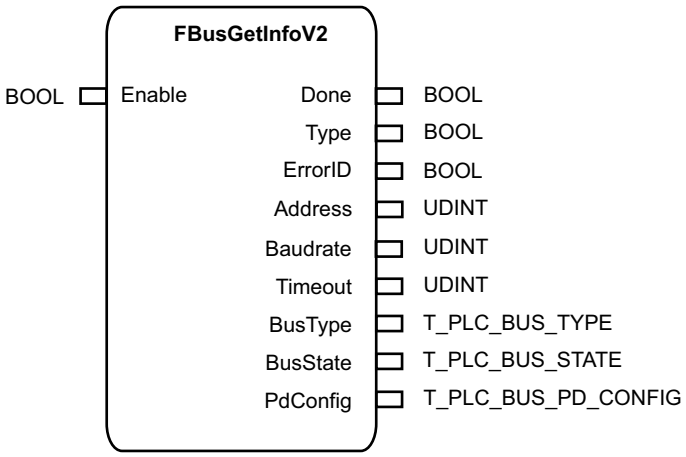
INFORMATION

For Modbus/TCP, the timeout monitoring must take place in the application (e.g. via a toggle bit).

5.3.2 Status of the Ethernet/IP fieldbus interface

The *FbusGetInfoV2* function block makes the status and some display parameters of the fieldbus interface available for the IEC program and for diagnostics.



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If there is no communication with the fieldbus master, the output *Error* is set to *TRUE*. During an active fieldbus connection, the output *Done* is set to *TRUE*, and the outputs *Address*, *Baud rate*, *timeout* and *Bus type* show the respective parameters as they were set via the parameter tree in MOVITOOLS® MotionStudio or via PLC.

5.3.3 Checking the process data communication

Now actual values can be read from the UHX71B-OSR71B controller and setpoint values can be written. The process data should correspond with the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio.

INFORMATION

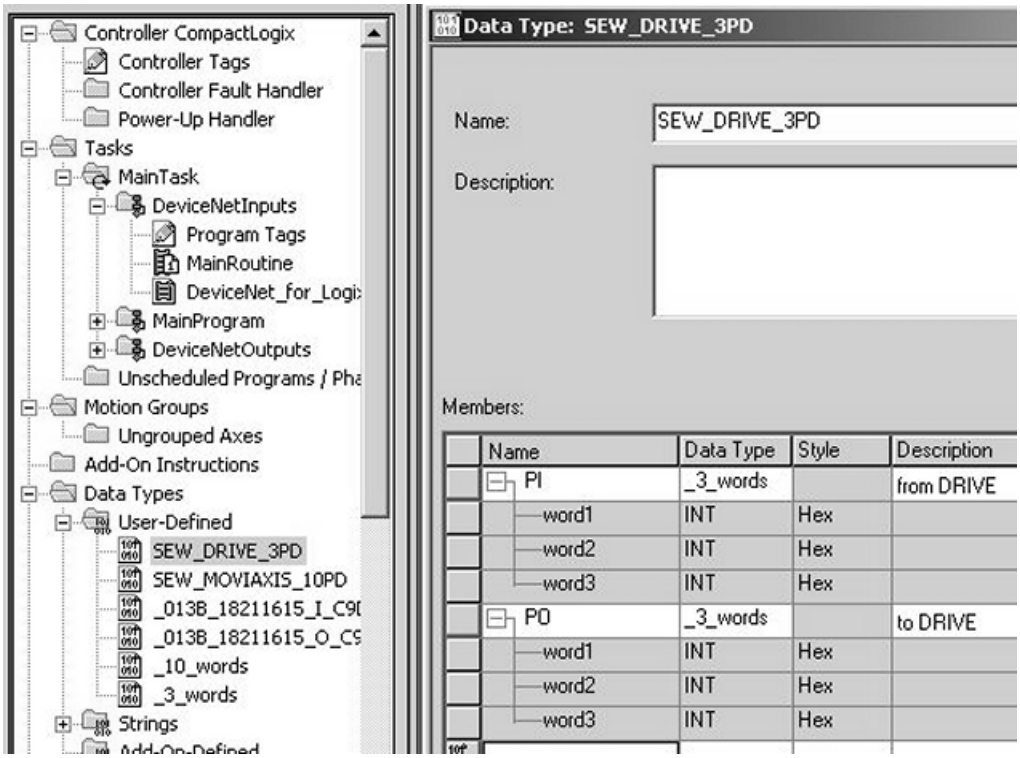
For more detailed information on process data communication in the IEC program, refer to the publication "MultiMotion for MOVI-PLC®".

5.4 Configuration examples in RSLogix5000

5.4.1 UHX71B-OSR71B with 16 PD data exchange

1. Set the IP address of the UHX71B-OSR71B controller (see chapter Setting the IP address parameters).
2. Add the UHX71B-OSR71B to the Ehernet/IP configuration according to chapter "Configuration of the master (Ethernet/IP scanner)".
3. You can now start integration into the RSLogix project.

   To do so, create a controller tag with a user-defined data type to create a simple, data consistent interface to the process data of the UHX71B-OSR71B controller (see following figure).



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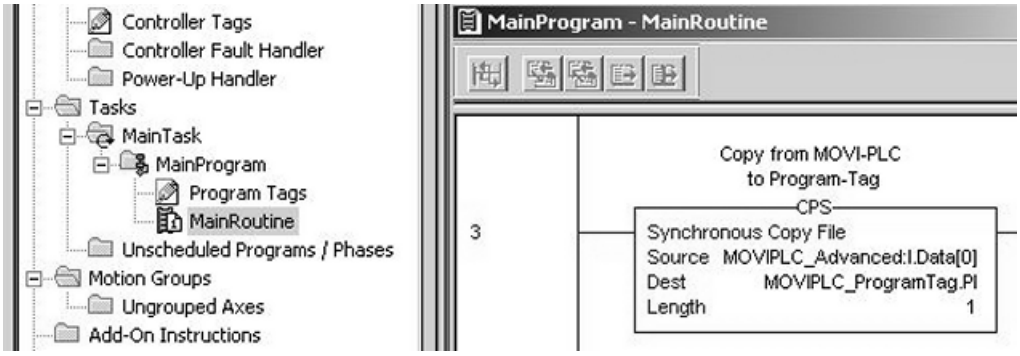
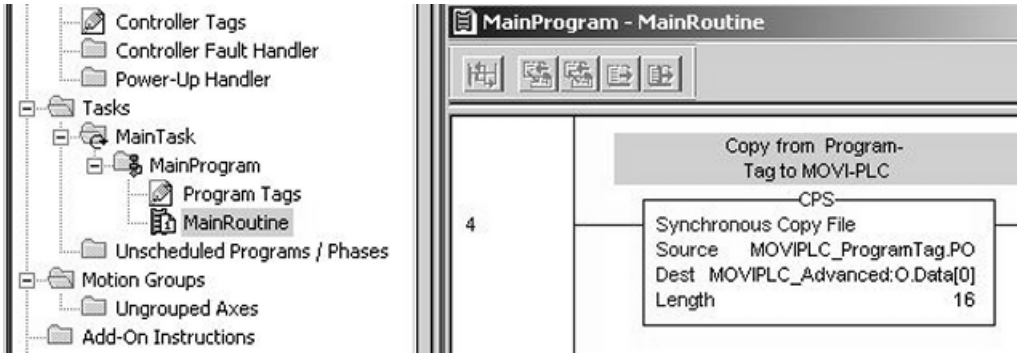
The description for the process input and output data of the controller tag can match the definition of the process data (PD) in the UHX71B-OSR71B.

4. To copy the data of the UHX71B-OSR71B to the new data structure, a CPS command is added at the start of the MainRoutine which reads the data from the controller tag (see following figure).



7882586123

To copy the data from the new data structure to the UHX71B-OSR71B, insert a CPS command at the end of the "MainRoutine" (see following figure).



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5. Now the project is saved and uploaded to the PLC. The PLC is set to RUN mode.

   Now actual values can be read from the UHX71B-OSR71B controller and setpoint values can be written.

   The process data should correspond to the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio. For more detailed information on process data connection in the IEC program, refer to the publication "MultiMotion for MOVI-PLC®".

6 Ethernet Industrial Protocol (EtherNet/IP)

6.1 Introduction

The EtherNet Industrial Protocol (EtherNet/IP) is an open communication standard based on the classic EtherNet protocols TCP/IP and UDP/IP.

EtherNet/IP was defined by the **O**pen **D**eviceNet **V**endor **A**ssociation (ODVA) and **C**ontrolNet **I**nternational (CI).

With EtherNet/IP, Ethernet technology is expanded to include the CIP (**C**ommon **I**ndustrial **P**rotocol) application protocol. CIP is known in the field of automation engineering because it is also used for DeviceNet and ControlNet as an application protocol.

6.2 Process data exchange

Up to 120 process data words can be exchanged with an EtherNet/IP master (scanner) depending on the use of the UHX71B-OSR71B unit. The EtherNet/IP master (scanner) sets the process data length when opening the connection.

In addition to a controlling "Exclusive Owner Connection", up to two additional "Listen Only Connections" are available. This means the actual values of the drive can also be read out by stand-by controllers or visualization devices.

If there is already a controlling connection via Modbus/TCP, you cannot activate an "Exclusive Owner Connection" via EtherNet/IP before a power-on reset.

6.2.1 Timeout response

The timeout status is triggered by the UHX71B-OSR71B option. The timeout interval must be set by the EtherNet/IP master (scanner) when the connection is established. The EtherNet/IP specification refers to a "Requested Packet Interval (RPI)" rather than a timeout time in this case.

The timeout interval displayed in the MOVITOOLS® MotionStudio parameter tree results from the Requested Packet Interval (RPI) multiplied with the "Timeout Multiplier".

This timeout interval is retained in the device when an "Exclusive Owner Connection" is removed, and the device switches to timeout status after the timeout interval has elapsed. The timeout status is displayed on the front of the UHX71B-OSR71B by the flashing red L13 LED.

A you can only activate the timeout delay via the bus, you must not change the value via MOVITOOLS® MotionStudio.

The timeout state causes the response programmed in the IEC program.

The timeout status can be reset via EtherNet/IP as follows:

- Via the reset service of the identity object (class 0x01, instance 0x01, undetermined attribute)
- By re-establishing the connection
- Via the reset bit in the control word

6.3 CIP object directory

In the Common Industrial Protocol, all unit data can be accessed via objects. The objects listed in the following table are integrated in the UHX71B-OSR71B.

Class [hex]	Name
01	Identity object
02	Message Router Object
04	Assembly Object
06	Connection Manager Object
07	Register Object
0F	Parameter Object
64	Vardata Object
F5	TCP/IP Interface Object
F6	EtherNet Link Object

The meaning of the objects and a description of how to access them is given in the following section.

6.3.1 Identity object

- The identity object contains general information on the EtherNet/IP device.
- Class code: 01_{hex}

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0001	Maximum instance

Instance 1

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Vendor ID	UINT	013B	SEW-EURODRIVE GmbH & Co KG
2	Get	Device Type	UINT	0065	Manufacturer-specific type
3	Get	Product Code	UINT	000A	Product no.10: UHX71B
4	Get	Revision	STRUCT of		Revision of the identity object, depends on firmware version
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD		→ Table in "Coding of attribute 5 Status"
6	Get	Serial number	UDINT		Unique serial number of fieldbus connection
7	Get	Product Name	SHORT_ STRING	SEW CONTROLLER POWER	Product name

- Coding of attribute 5 "Status"

Bit	Name	Description
0	Owned	Controlling connection is active
1	-	Reserved

Bit	Name	Description
2	Configured	Configuration complete
3	-	Reserved
4 – 7	Extended Device Status	See table "Coding of the Extended Device Status"
8	Minor Recoverable Fault	Minor error that can be remedied
9	Minor Unrecoverable Fault	Minor error that cannot be remedied
10	Major Recoverable Fault	Major error that can be remedied
11	Major Unrecoverable Fault	Major error that cannot be remedied
12 – 15	-	Reserved

- Coding of the “Extended device status” (bits 4 – 7):

Value [binary]	Description
0000	Unknown
0010	At least one faulty I/O connection
0011	No I/O connection established
0110	At least one I/O connection active

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	X
05	Reset	-	X
0E	Get_Attribute_Single	X	X

6.3.2 Message router object

- The message router object provides information on the implemented objects.
- Class code: 02_{hex}

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0001	Revision 1

Instance 1

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Object_List	STRUCT of		Object list comprising: • Number of objects • List of objects
		Number	UINT	0009	
		Classes	ARRAY of UINT	01 00 02 00 04 00 06 00 07 00 0F 00 64 00 F5 00 F6 00	
2	Get	Number Available	UINT	0009	Maximum number of connections

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	-
0E	Get_Attribute_Single	X	X

6.3.3 Assembly object

- The assembly object is used to access the UHX71B-OSR71B process data. IO connections can be created for the instances of the assembly object to exchange cyclic process data.
- Class code: 04_{hex}

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0002	Revision 2
2	Get	Max Instance	UINT	0082	Maximum instance

Instance 161 – SEW PO data range

This instance is used to access the UHX71B-OSR71B process output data. MOVIDRIVE® can be controlled by only one scanner. Therefore, only one connection can be established with this instance.

Attribute	Access	Name	Data type	Default value [hex]	Description
3	Get	Data	Array of BYTE	-	OUTPUT assembly

Instance 121 – "Heartbeat"

This instance is accessed when the scanner wants to establish an input only connection. No process output data is sent with this type of connection. It is used only to read process input data.

Attribute	Access	Name	Data type	Default value [hex]	Description
3	Get	Data	Array of BYTE	-	OUTPUT assembly Data size = 0

Instance 171 – SEW PI data section

This instance is used to access the UHX71B-OSR71B process input data. Several multicast connections or a point-to-point connection can be established to this instance.

Attribute	Access	Name	Data type	Default value [hex]	Description
3	Get	Data	Array of BYTE	-	INPUT assembly

INFORMATION

The designations "INPUT assembly" and "OUTPUT assembly" refer to the processes as seen from the network's point of view. An "INPUT assembly"" produces data on the network, "OUTPUT assembly" consumes data from the network.

Supported services

Service code [hex]	Service Name	Class	Instance 161	Instance 121	Instance 171
0E	Get_Attribute_Single	X	X	-	X

6.3.4 TCP/IP interface object

- The TCP/IP interface object enables the IP parameters to be configured via EtherNet/IP.
- Class code: $F5_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0001	Maximum instance
3	Get	Number of Instances	UINT	0001	DHR41B has one TCP/IP interface

Instance 1

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Status	DWORD	00000001	Valid configuration
2	Get	Configuration capability	DWORD	00000014	The interface configuration attribute (5) is writable. The DHCP can be used for configuration.
3	Set	Configuration control	DWORD	00000002	0 = The unit uses the stored IP parameters at startup. 2 = The unit waits for its IP configuration via DHCP at startup.
4	Get	Physical Link Object	STRUCT of		Reference to the EtherNet link object (class code 0xF6) as sublayer.
		Path Size	UINT	0002	
		Path	Padded EPATH	20 F6 24 01	
5	Set	Interface configuration	STRUCT of		
		IP Address	UDINT		Current IP address
		Network Mask	UDINT		Current subnetwork mask
		Gateway Address	UDINT		Currently set standard gateway
		Name Server	UDINT	00000000	DNS is not supported
		Name Server 2	UDINT	00000000	DNS is not supported
		Domain Name	STRING	sew.de	
6	Get	Host Name	STRING		Not used

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	_
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	-	X

6.3.5 Ethernet link object

- Information on the Ethernet communication interface is stored in the Ethernet link object.
- Class code: $F6_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0002	Revision 2
2	Get	Max Instance	UINT	0002	Maximum instance
3	Get	Number of Instances	UINT	0002	DHR41B has 2 Ethernet interfaces

Instance 1 – Ethernet connection X21

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Interface Speed	UDINT	00000064	Default value = 100 → transmission speed in MBit/s
2	Get	Interface Flags	DWORD		• Bit 0 displays the active link • Bit 1 displays full duplex mode • Bit 2 – bit 4 indicate the negotiation status • Bit 5 shows whether the manual setting has to be reset • Bit 6 indicates a local hardware error
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

Instance 2 – Ethernet connection X22

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Interface Speed	UDINT	00000064	Default value = 100 → transmission speed in MBit/s
2	Get	Interface Flags	DWORD		• Bit 0 displays the active link • Bit 1 displays full duplex mode • Bit 2 – bit 4 indicate the negotiation status • Bit 5 shows whether the manual setting has to be reset • Bit 6 indicates a local hardware error
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	_
0E	Get_Attribute_Single	X	X

6.4 General Error Codes

General error code (hex)	Error name	Description
00	Success	Successful
01	Connection failure	A connection-specific service has failed.
02	Resource unavailable	The source required for performing the service is unavailable.
03		Reserved
04	Path segment error	The processing node was unable to interpret the "Path Segment Identifier" or the segment syntax.
05	Path destination unknown	The "Path" refers to an object class, object instance or a structural element that is not supported by the processing node.
06 – 07		Reserved
08	Service not supported	The service is not supported for the selected class/instance
09	Invalid attribute value	Invalid attribute data have been sent.
0A – 0B		
0C	Object state conflict	The selected object cannot perform the service in its current status.
0D		Reserved
0E	Attribute not settable	It is not possible to access the selected object for writing.
10	Device state conflict	The current status of the device makes it impossible to perform the required service.
11 – 12		Reserved
13	Not enough data	The length of the transferred data is too short for the service to be performed.
14	Attribute not supported	The selected attribute is not supported.
15	Too much data	The length of the transferred data is too long for the service to be performed.
16	Object does not exist	The selected object is not implemented in the device.
17 – 1D		Reserved
1E	Embedded Service Error	Internal processing error
1F	Vendor specific error	Manufacturer-specific error (see "Fieldbus Unit Profile" manual)
20	Invalid parameter	Invalid parameter. This error message is used when a parameter does not satisfy the requirements of the specification and/or the requirements of the application.
21 – FF		Reserved

7 Configuration and Startup (Modbus/TCP)

This section provides information about the configuration of the Modbus/TCP master and startup of the inverter for fieldbus operation. Prerequisite is the correct connection and setting of the IP address parameters of the UHX71B-OSR71 in accordance with the section "Assembly and Installation Instructions".

INFORMATION

- There are no specific unit description files for Modbus/TCP.
- For Modbus/TCP, the timeout monitoring must take place in the application (e.g. via a toggle bit).

7.1 Configuration for the master (Modbus scanner)

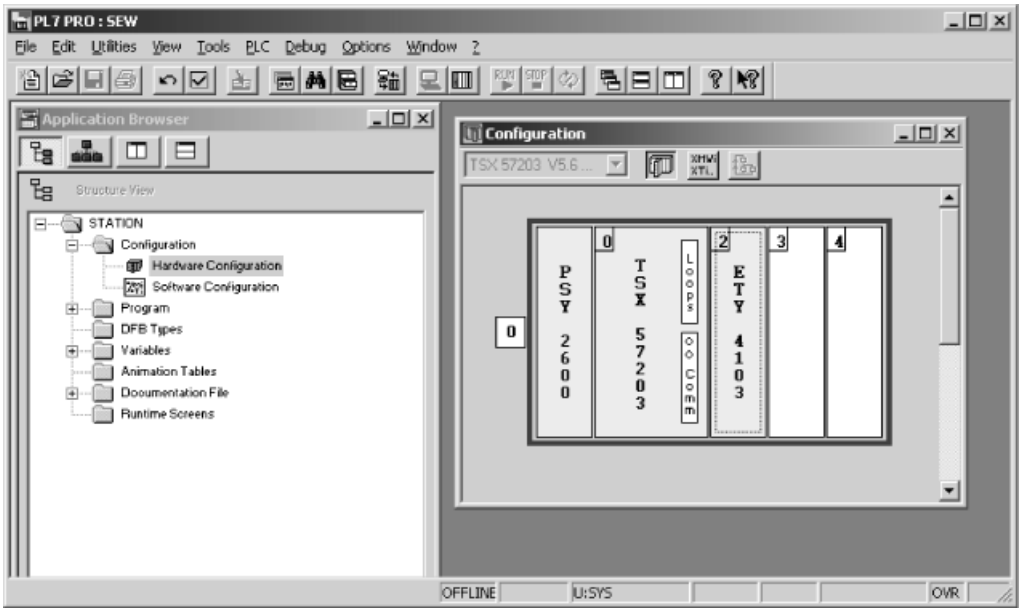
The first example refers to the configuration and programming of a Schneider Electric control system TSX Premium P57203 using the programming software PL7 PRO. An ETY4103 is used as the Ethernet component. The information and illustrations are based on the English version of the PL7 PRO software.

INFORMATION

- Enter values in PL7 PRO using the keypad.
- As Ethernet bus master, use components from Schneider Electric that support I/O scanning. The Modbus/TCP interface module for SEW drives cannot be addressed via "Peer Cop". However, Ethernet-Busmasters that only support "Peer Cop" can access the drives from the PLC program using read and write commands.

7.1.1 Hardware configuration

- Start PL7 PRO and enter the control type.
- Enter the hardware configuration for the control system in the application browser under STATION / Configuration / Hardware configuration.



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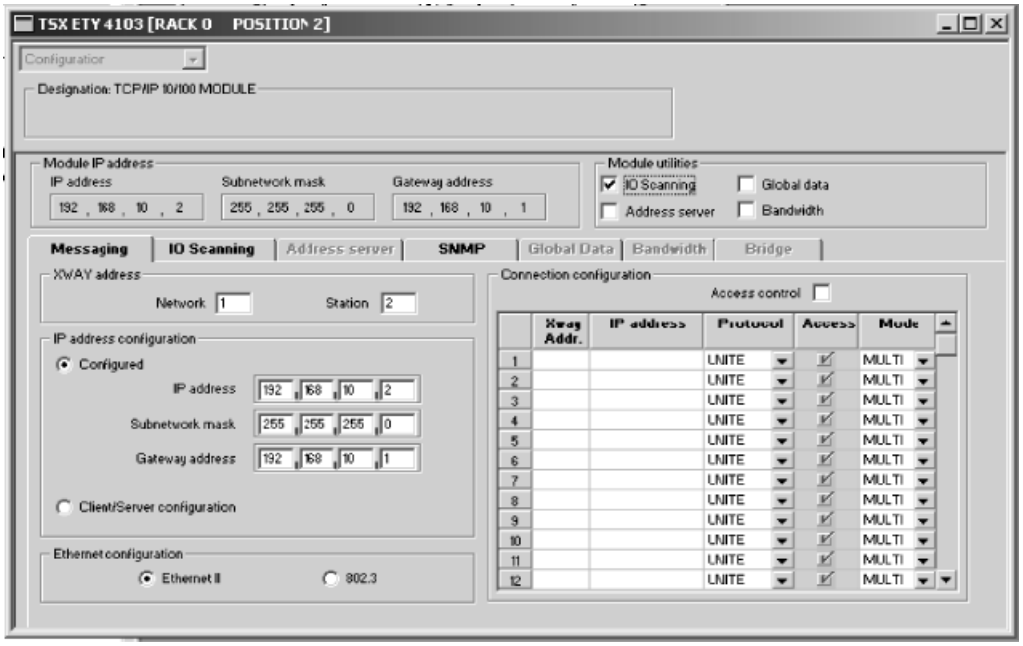
7.1.2 Settings for the Ethernet component

- To open the configuration window, double-click on the Ethernet component.
- If you have a non-extendable rack, enter a "1" in the "Network" input field in the "XWAY address" section.
- Enter the number of the slot that the Ethernet component is plugged into (here: 2) in the input field "Station" in the "XWAY address" section. 2). In this case, the XWAY address is 1.2.
- In the section "IP address configuration", select the checkbox "Configured". Enter the IP address and the network parameters in the input fields "IP address", "Subnetwork mask" and "Gateway address". If the control system is to receive the address parameters via a DHCP server, select the radio button "Client/Server configuration" in the section "IP address configuration".
- In the "Ethernet configuration" section, select the checkbox "Ethernet II".
- In the "Module utilities" group, select the "IO Scanning" radio button.



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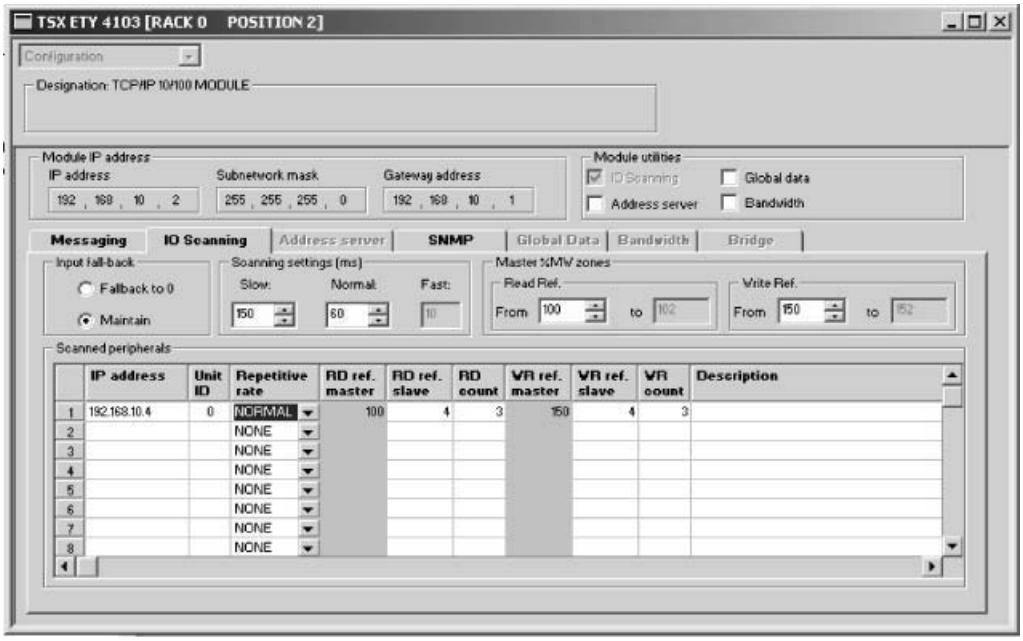
7.1.3 Addressing the drive using I/O scanning

- Select the "IO Scanning" tab. In this tab page you specify which of the stations connected to the Modbus are to exchange cyclical data.
- In the section "Master %MW zones" enter the control memory areas that are to be used to exchange cyclical data with the Modbus stations. You will use the memory addresses later in your PLC program.
- Enter the following in the "Scanned peripherals" group:
  - In the "IP address" input field, enter the IP address of the SEW drive.
  - In the "Unit ID" field, enter "0".
  - In the "Repetitive rate" dropdown menu, enter the cycle time that is used to address the stations.
  - Enter the value "4 "in the input fields "RD ref.slave" and "WR ref. slave" as the cyclical data are available from offset 4.
  - In the input fields "RD count" and "WR count" enter the number of words to be exchanged. The values must be the same in both fields. You can set 1 – 64 words for the UHX71B-OSR71B.



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- Click on the button "Confirm" to confirm the rack configuration and the global configuration.
- Once you have transferred your settings and started the program, the color of LED L13 (NETWORK/STATUS) of DHR41B changes to green (see chapter "Status LED").

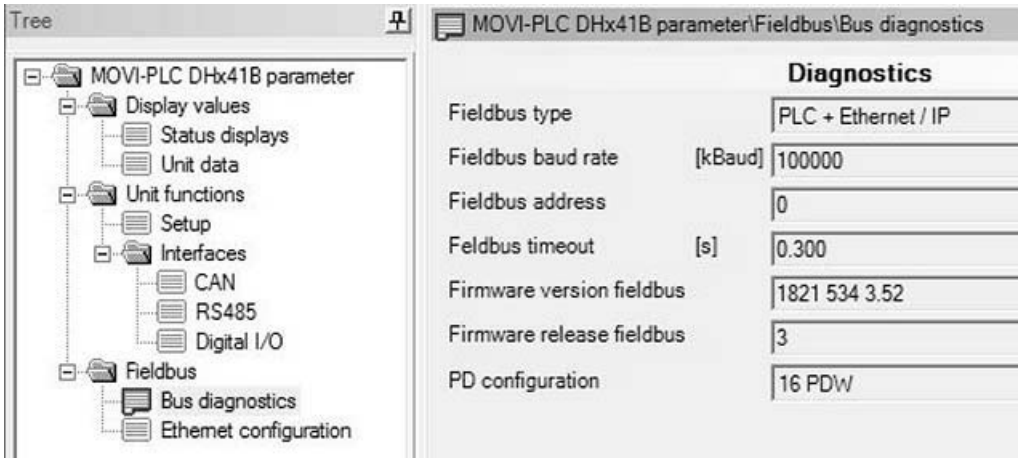
7.2 Settings in the UHX71B-OSR71B controller

The creation of IEC programs is described in detail in the "MOVI-PLC®" manual. This section only describes the fieldbus-specific characteristics.

7.2.1 Process data configuration

The process data interface is normally configured by the master (scanner). The master sets the number of process data words.

In the parameter tree of MOVITOOLS® MotionStudio (index 8451), the currently set value is displayed in the field "PD configuration" (see following figure).



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INFORMATION

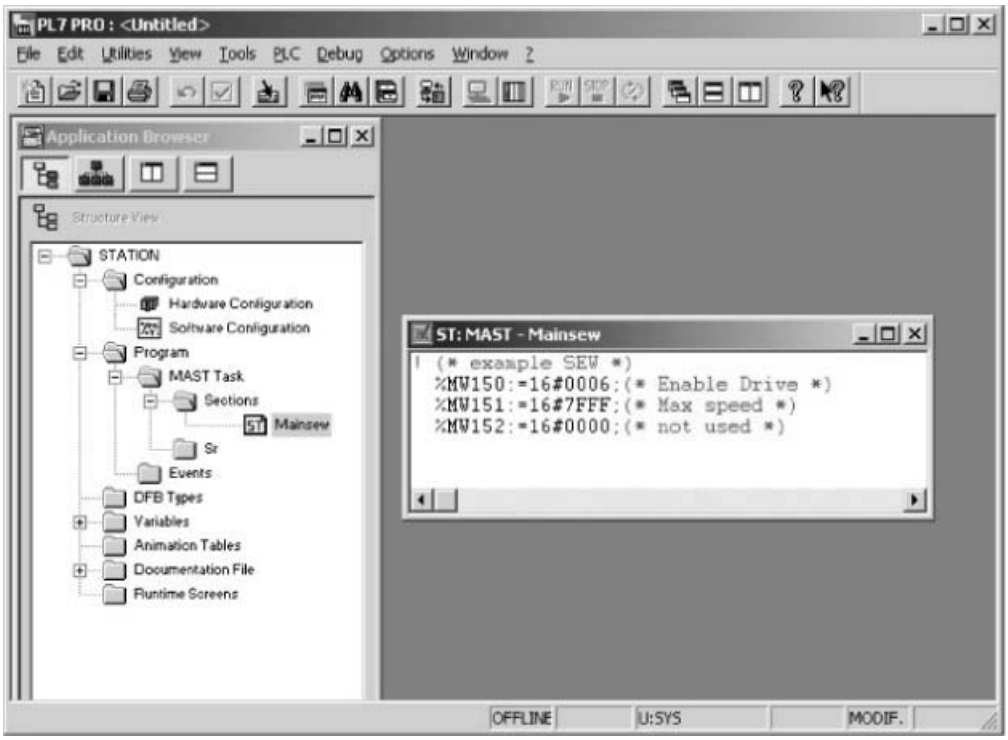
For Modbus/TCP, the timeout monitoring must take place in the application (e.g. via a toggle bit).

7.3 Project planning example in PL7 PRO

7.3.1 UHX71B-OSR71B controller with 16 PD data exchange

1. Set the IP address of the UHX71B-OSR7141B controller (see chapter Setting the IP address parameters).
2. Integrate the UHX71B-OSR71B into the configuration for the IO scanning according to section "Configuration of the master (Modbus scanner)".
3. Now, the integration into the PLC project can be performed.
4. Create a new section in PL7 PRO in the application browser under [`Station] / [Program] / [Mast Task] / [Sections]`.

5. In this example, the setpoints for the drive start from MW150 (see following figure).



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6. Now the project is saved and uploaded to the PLC. The PLC is set to RUN mode.

   Now actual values can be read from the UHX71B-OSR71B controller and setpoint values can be written.

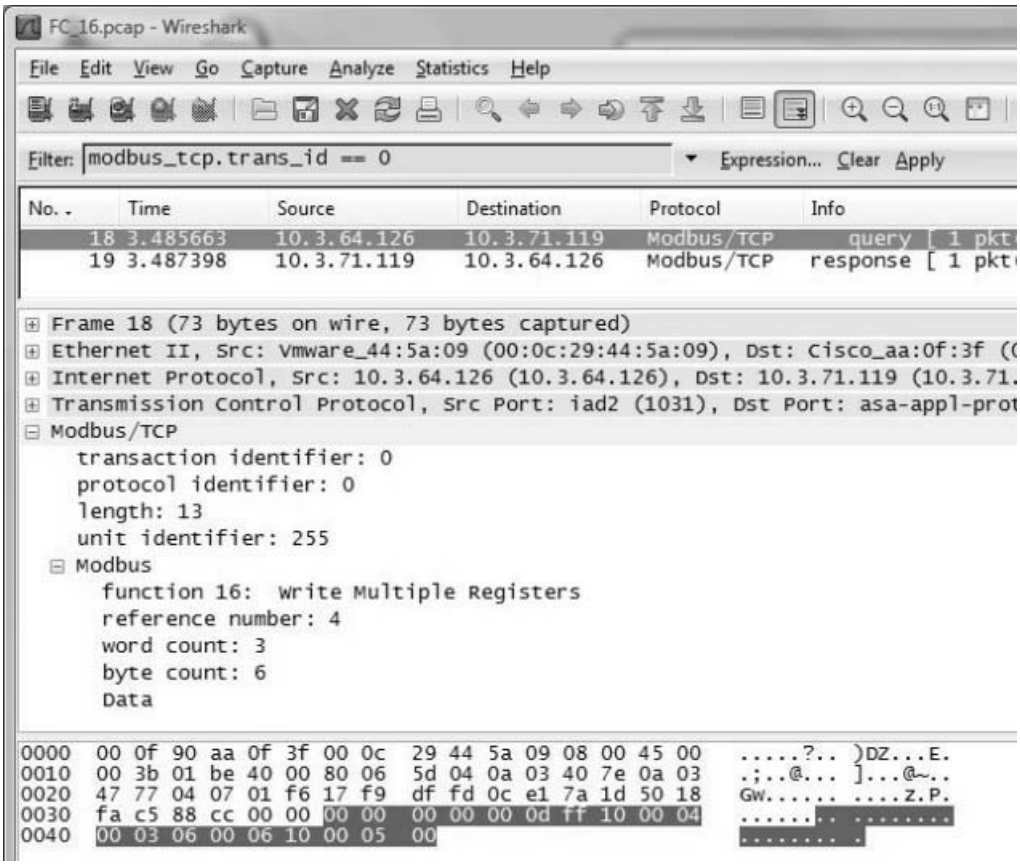
   The process data should correspond to the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio. For more detailed information on the process connection in the IEC program, refer to the publication "MultiMotion for MOVI-PLC®".

7.4 Examples for data exchange via Modbus/TCP

As there are many different master systems and software solutions available for Modbus/TCP for standard PCs, there is no "reference controller" the examples are based on. This is why this section gives detailed examples regarding the telegram structure.

You can use the telegram structure from these examples and compare it to the structure used in your application for troubleshooting purposes. There are simple tools for recording telegrams via the Ethernet network, e.g. Wireshark (see following figure), Packetizer etc. These freeware tools are available on the Internet.

Observe that tracing all Ethernet telegrams in a network is only possible with a tab, hub or a switch with a port mirror function. The telegrams sent from and to the PC which is also used for recording can always be recorded, of course.



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The figure above provides an example of how setpoints are written (FC16) to the Modbus/TCP slave with IP address 10.3.71.119. The 3 process data words are located from offset 4 (reference number) and are addressed via unit ID 255.

All the other examples merely describe the Modbus/TCP part of the telegram. The TCP/IP part of the telegram, as well as establishing and dropping a TCP/IP connection are not explained in detail.

7.4.1 Writing and reading process data

The process data exchange can be performed either via FC3 (read) and FC16 (write), or FC23 (read and write):

For writing 3 process data words (setpoints) to a Modbus/TCP slave via FC16, the TCP/IP telegram to port 502 is structured as illustrated above.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description refer to the Modbus/TCP specification and section "Modbus protocol (Modbus/TCP)"
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (number PD) × 2 + 7 = 13	
5	0x0d			
6	0xFF	Unit identifier	Must be 0 or 255	
7	ox10	Function code	Service = FC16 (Write Register)	
8	0x00	Write Reference-number	Offset where PD start: Must always be 4	
9	0x04			
10	0x00	Write word count	Number of PD (here 3): Must for PD 1...64	
11	0x03			
12	0x06	Write byte count	Number of PD × 2 = 6	
13	0x00	Data	Process output data word 1	Data mapping and definition, see IEC program
14	0x11			
15	0x22		Process output data word 2	
16	0x33			
17	0x44		Process output data word 3	
18	0x55			

Only bytes 0-11 are returned in the response telegram of port 502 of the Modbus/TCP slave, where all values remain unchanged with the exception of byte 5. Byte 5 (low byte length field) is corrected to value 6.

During process data exchange via FC23, the telegram that is used to write and read 3 process data words (PD) each is structured as follows.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description refer to the Modbus/TCP specification and section "Modbus protocol (Modbus/TCP)"
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (number PD) × 2 + 11 = 17	
5	0x11			
6	0xFF	Unit identifier	Must be 0 or 255	
7	0x10	Function code	Service = FC23 (read + write register)	
8	0x00	Read reference number	Offset where PD start: Must always be 4	
9	0x04			
10	0x00	Read word count	Number of PD (here 3): Must for PD 1 – 64	
11	0x03			
12	0x00	Write reference number	Offset where PD start: Must always be 4	
13	0x04			
14	0x00	Write word count	Number of PD (here 3): see read word count	
15	0x03			
16	0x06	Write byte count	Number of PD × 2 = 6	
17	0x00	Data	Process output data word 1	Data mapping and definition, see IEC program
18	0x11			
19	0x22		Process output data word 2	
20	0x33			
21	0x44		Process output data word 3	
22	0x55			

The following data bytes are returned in the response telegram of the Modbus/TCP slave.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description refer to the Modbus/TCP specification and section "Modbus protocol (Modbus/TCP)"
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (number PD) × 2 + +3 = 9	
5	0x09			
6	0xFF	Unit identifier	Must be 0 or 255	
7	0x17	Function code	Service = FC23 (read + write register)	
8	0x06	Write byte count	Number of PD × 2 = 6	
9	0x00	Data	Process input data word 1	Data mapping and definition, see IEC program
10	0xAA			
11	0xBB		Process input data word 2	
12	0xCC			
13	0xDD		Process input data word 3	
14	0xEE			

8 Modbus Protocol (Modbus/TCP)

8.1 Introduction

Modbus/TCP is an open protocol based on TCP/IP. It was one of the first protocol types to become standard in industrial Ethernet interfaces for process data transfer.

Modbus frames are exchanged via the TCP/IP port 502. Every master IP address is accepted. Modbus exclusively uses the coding "BIG ENDIAN" (Motorola data format or high byte first).

Access via "Peer Cop" is not possible. Make sure that the bus master supports "IO scanning".

Modbus/TCP is integrated into the UHX71B-OSR71B as of firmware version .11.

8.1.1 Mapping and addressing

The logic Modbus address range is 64 k words and is addressed via the reference number (offset). Four different tables can be in the address range:

- Binary inputs (RO)
- Binary outputs (RW)
- Input register (RO)
- Output register (RW)

The tables can be separated or overlapping.

The UHX71B-OSR71B option provides the following data areas:

- For process data transfer, there is a table that allows for write access (for setpoint values) as well as read access (for actual values).

  This table starts at offset 4 and ends at offset $0FF_{hex}$. It contains the 1 – 64 cyclically transferred process data words.
- The process data output words from the controller are also saved in another table. It allows for one or several additional clients (e.g. visualization) to read the current setpoint values.

  This table starts at offset 104_{hex} and ends at offset $1FF_{hex}$.
- The remaining address scope from offset 400_{hex} to $FFFF_{hex}$ is reserved and must not be addressed.

  The data word at offset 219_{hex} (8606_{dec}) is a special case, it allows for writing (and reading) the timeout monitoring time.

INFORMATION

Note the following for control systems from Schneider Electric:

The address range often starts with 40001_{hex}, which corresponds to an offset with the value "0".

8.1.2 Services (function codes)

For process data exchange, parameter data exchange and unit identification, the UHX71B-OSR71B provides 4 FC.. services (**F**unction **C**odes).

- FC 3 Read Holding Registers
- FC16 Write Multiple Registers
- FC23 Read/Write Multiple Registers
- FC43 Read Device Identification

The FC3 and FC16 services allow reading or writing of one or more registers. FC23 allows a register block to be read and written simultaneously. FC43 can be used for a unit identification by reading out the identity parameters.

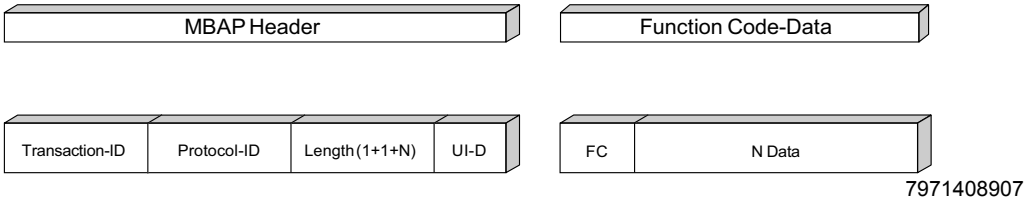
8.1.3 Access

The implemented registers and possible services (function codes) for data exchange are summarized in the following table.

	Meaning of			
Offset (hex)	**Read**	**Write**	**Access**	**Comment**
0 – 3	-	-	-	Reserved
4 – FF	Process input data (actual values)	Process output data (setpoint values)	FC3, FC16, FC23	0 – 64 words
100 – 103	-	-	-	Reserved
104 – 1FF	Process output data (setpoint values)	-	FC3	For reading the setpoint values by a client other than the controlling one
200 – 2FF	Result acyclical parameter channel	Request acyclical parameter channel	FC3, FC16, FC23	4 words
300 – FFFF	-	-	-	Reserved
Special case: 219E (8606_{dec})	Fieldbus timeout interval, read value	Fieldbus timeout interval, write value	FC3, FC16	Parameter P819: 16-bit value, timeout interval in ms

8.2 Protocol structure

The Modbus protocol consists of a header and function code data. The header is the same for all request/response telegrams and error messages (exceptions). Depending on the function code, a different number of data is attached to the header (see following picture).



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8.2.1 Header

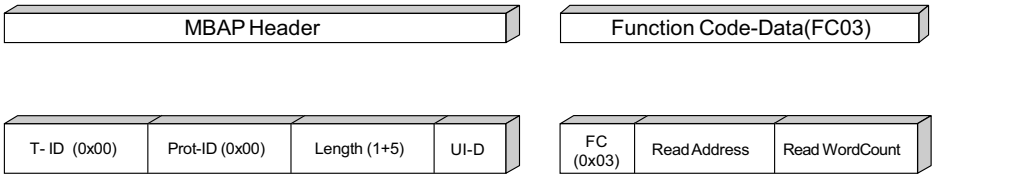
The protocol bytes of the header are described in the following table:

Byte	Designation	Meaning
0	Transaction identifier	Often "0", is simply copied by the server (slave)
1		
2	Protocol identifier	0
3		
4	Length field (upper byte)	0
5	Length field (lower byte)	Number of function codes data bytes +1 (Unit identifier)
6	Unit identifier (slave address)	This is the slave address. In order to access the UHX71B-OSR71B process data, it must be set to "0" (0x00) or 255 (0xFF). The following address assignments apply to the parameter channel access (Offset 200 - 203_{hex}): • 0 or 254 for parameters of the UHX71B-OSR71B • 1 - 253 for parameters of a lower-level unit connected to UHX71B-OSR71B. The assignment of unit identifier to the units on the system buses is determined via the routing table on the UHX71B-OSR71B memory card (see chapter Appendix).
7	Function code	Requested service
8 ...	Data	Data depending on requested service

- The slave simply copies the transaction identifier (byte 0 and 1). It can help the master to identify related actions.
- The Protocol identifier (byte 2 and 3) must always be "0".
- The length bytes (byte 4 and 5) specify the number of bytes occurring in the length field. As the maximum telegram length is 255 bytes, the "upper byte" must be "0".
- The unit identifier (byte 6) can be used for distinguishing between several connected stations (e.g. bridges or gateways). It has the function of a subaddress that is only used for parameter access in SEW units. The process data are always mapped to the unit that is addressed via the unit identifier 0 or FF_{hex}.
- The 7 bytes of the header are followed by the function code and the data.

8.2.2 Service FC3 – Read Holding Registers

With the service *FC3 Read holding registers*, you can read a variable number of registers (see following figure).



Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Requested service: 3 (Read Holding Register)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

Response:

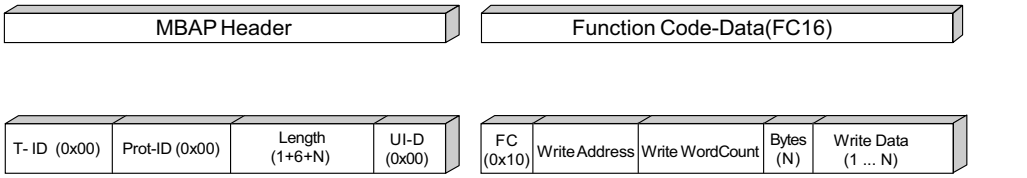
Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Service: 3 (Read Holding Register)
8	Byte count	Number of following bytes
9....	Data	2 – ... Data bytes depending on length

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	83_{hex}
8	Exception Code	Error code

8.2.3 FC16 – Write Multiple Registers

With the service *FC16 Write Multiple Registers* you can write a variable number of registers (see following figure).



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Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Requested service: 16 (Write Multiple Registers)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)
12	Byte count	2* Word Count
13 ...	Register values	2 – ... Data bytes depending on length

Response:

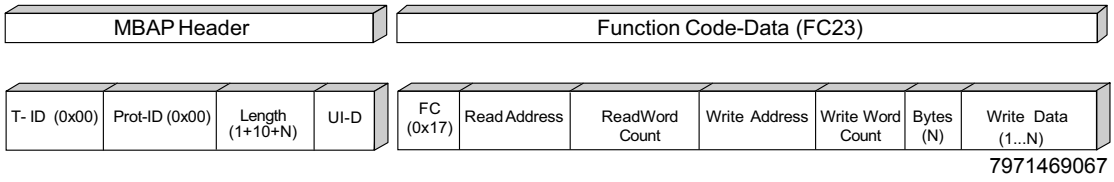
Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Service: 16 (Write Multiple Registers)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	90_{hex}
8	Exception Code	Error code

8.2.4 Service FC23 – Read/Write Multiple Registers

With the service *FC23 Read/write multiple registers*, you can simultaneously write and read a variable number of registers. The write access is carried out first. Preferably, this service is used for the process data (see following picture).



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Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Requested service: 23 (Read/Write Multiple Registers)
8	Read reference number (high)	Offset
9	Read reference number (low)	Offset
10	Read word count (high)	Number of words (register) always 0
11	Read word count (low)	Number of words (register)
12	Write reference number (high)	Offset
13	Write reference number (low)	Offset
14	Write word count (high)	Number of words (register) always 0
15	Write word count (low)	Number of words (register)
16	Write byte count	2* Word Count
17 ...	Write register values	2 – ... Data bytes depending on length

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Service: 23 (Read/Write Multiple Registers)
8	Byte count	Number of following bytes
9	Data	2 – ... Data bytes depending on length

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	97_{hex}
8	Exception Code	Error code

8.2.5 Service FC43 - Read Device Identification

The service *FC43 Read Device Identifications* is also referred to as MEI ("Modbus Encapsulated Interface Transport"). It can tunnel services and method calls. The service *Read Device Identification* is tunneled with the MEI-Type 0x0E. According to the Modbus specifications, there are 3 blocks *Basic*, *Regular* and *Extended* that can be read. The UHX71B-OSR71B supports the *Basic* and *Regular* blocks (conformity level 02). The entire block is always read (streaming). This means that values 01 and 02 are permitted in the *Read Device ID Code*. The *Object ID* must be zero. The response is not fragmented.

Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Requested service: 43 (Read Device Identification)
8	MEI type	0x0E
9	Read device ID code	01 or 02
10	Object ID	0

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	Service: 43 (Read Device Identification)
8	MEI type	0x0E
9	Read device ID code	01 or 02
10	Conformity level	02
11	More follows	0
12	Next object ID	0
13	Number of objects	e.g. 3
14	Object ID	
15	Object length	
16	Object value	
17	....	

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See section "Header"
7	Function code	43_{hex}
8	Exception Code	Error code

Objects

UHX71B-OSR71B

Object ID	Name	Type	M/O	Category	Value (example)
0x00	VendorName	ASCII string	Mandatory	Basic	"SEW-EURODRIVE"
0x01	ProductCode				"SEW CONTROLLER POWER"
0x02	MajorMinorRevisons				"823 568 0.10" (e.g.)
0x03	VendorUrl		Optional	Regular	"www.sew.de"
0x04	ProductName				"SEW CONTROLLER POWER"
0x05	ModelName				"UHX71B-OSR71B"

8.3 Connection management

Up to 8 simultaneous Modbus connections are possible, max. one of which has write access to the process data area (controlling connection).

Connections that are no longer used must be disconnected by the master. If a ninth connection is required and the slave detects an inactive connection, the slave disconnects the inactive connection as it presumes that the corresponding master is no longer active. If there are 8 active connections, the attempt to establish a ninth connection is cancelled (socket is closed on the server). Connections 1 - 8 operate independently of each other. There is no prioritization. Only one controlling connection that can change process data is permitted.

If a controlling connection has already been established via EtherNet/IP, you cannot establish another controlling connection via Modbus/TCP. The slave can at least buffer one frame with maximum Modbus length on receipt or transmission.

8.3.1 Sending process output data (requesting controlling connection)

Sending process output data is only permitted if the connection already is a controlling connection or if there is no controlling connection. If the unit accepts the connection, it transfers the process output data to the process data image or transmits the process data to a lower-level station (gateway operation). As long as this connection is activated, no other master can change the process output data (PO data).

8.3.2 Dropping connections

A connection is deleted from the internal connection list in the following cases:

- if the "keep alive" time has elapsed and the server no longer receives a response, or
- if the socket reports an error
- if the connection to the client has been dropped

  If it was a controlling connection, another controlling connection can be established. If no valid PO data has been sent within the timeout interval, a fieldbus timeout is triggered.

The default keep-alive time is 10 seconds. If there is a controlling connection with the timeout interval > 5 s, the keep-alive time is increased to 2 × timeout interval.

In a controlling connection, the fieldbus timeout is displayed in the unit after the set timeout interval elapses during a break in the cable or an error in the socket. Then a new controlling connection can be established.

8.3.3 Timeout monitoring

INFORMATION

For Modbus/TCP, the timeout monitoring must take place in the application (e.g. via a toggle bit).

9 Error Diagnostics for Operation on EtherNet/IP and Modbus/TCP

9.1 Diagnostic procedure

The diagnostic procedures described below demonstrate the integration of the UHX71B-OSR71B into an Ethernet network and the error analysis method for the following problems:

- The UHX71B-OSR71B controller is not integrated properly in the EtherNet/IP or Modbus/TCP network
- The master (scanner) cannot specify any process data.

For further information regarding the programming of the UHX71B-OSR71B, refer to the manual "MultiMotion for MOVI-PLC®".

For more diagnostic information, refer to the online status display in the EtherNet/IP master (scanner), in the Modbus/TCP master and the corresponding online help.

9.1.1 Step 1: Checking the LED status

Check the status of the LED on the UHX71B-OSR71B acc. to chapter "Status LED".

In order to check and set the IP parameters, you can proceed according to section "Setting IP address parameters" or use MOVITOOLS® MotionStudio.

The PING and IPCONFIG commands that you can enter via the DOS console on your PC are further tools for checking the communication via Ethernet.

9.1.2 Step 2: Check the Status LED and the Status display of the master (scanner)

To do so, use the documentation of the controller or master module.

Should there be no working EtherNet/IP or Modbus/TCP master yet, you can use an SEW master simulator for testing or starting up the UHX71B-OSR71B. The latest version of the master simulator is available on the SEW website.

You can use the SEW master simulator to exchange process or parameter data with EtherNet/IP or Modbus/TCP profile with an SEW fieldbus interface.

9.1.3 Step 3: Error diagnostics

If the UHX71B-OSR71B is in the "Connected" status, data exchange between master (scanner) and slave is active. If the data is not transferred to the IEC application of the UHX71B-OSR71B via EtherNet/IP or Modbus/TCP correctly, the following steps will assist you in finding the cause for the problem.

A Are the correct values for the process data words displayed in the PLC Editor?

If yes, continue with F.

B Is the process data exchange activated in the scanner (master)?

C Is the process data written to the correct location in the scanner? Check the tags and scanner mapping.

D Is the PLC in RUN mode or does active forcing overwrite the transfer of the normal process data words?

E If the PLC does not transmit data to the UHX71B-OSR71B, refer to the documentation of the PLC manufacturer for support.

F Are the process data words being used correctly in the IEC program?

G Which status is displayed in the IEC application for the communication interface via the *FBusGetInfo* module (see chapter Settings in the UHX71B-OSR71B)?

10 PROFINET IO Configuration

10.1 Installing the GSDML file for UHX71B-OSR71B

INFORMATION

The latest versions of the GSD(ML) files are available for download from the SEW website (**www.sew-eurodrive.com**). You find them in the "Software" section of the respective units.

Proceed as follows to install the GSD file:

1. Start STEP 7 HW Config and select the [Install new GSD file] menu item from the [Extras] menu.

   A window is displayed.

2. Click [Browse] and select the GSDML file matching the UHX71B-OSR71B SEW controller:

GSDML file	SEW controller
GSDML-V2.1-SEW-Controller-Power-yyyymmdd.xml	UHX71B

   "yyyymmdd" represents the date.

3. Click [OK] for confirmation.

4. You find the PROFINET IO interface for the respective controller in the hardware catalog under [PROFINET IO] / [Other field units] / [Drives] / [SEW] / [*SEW controllers*].

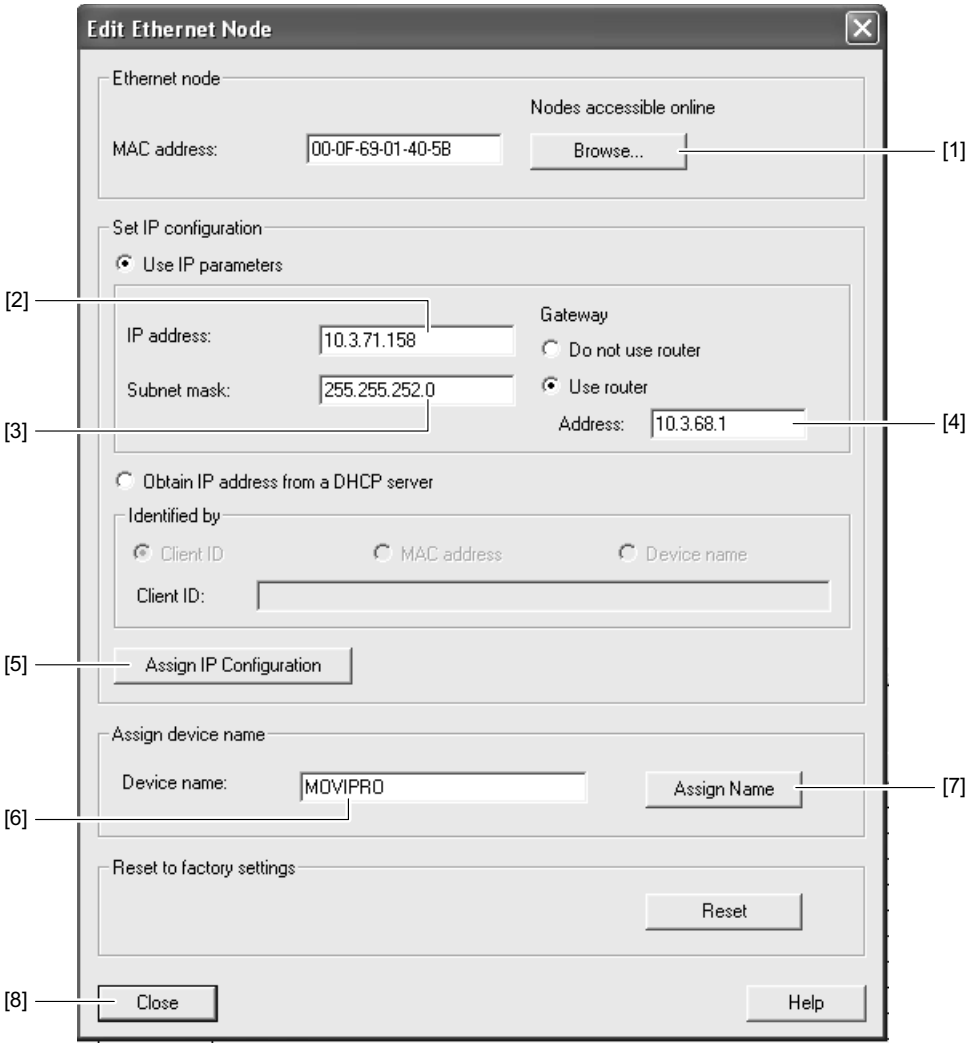
   For more information regarding the PROFINET interface of the UHX71B-OSR71B, refer to chapter "Configuring a PROFINET interface for the UHX71B-OSR71B".

10.2 Assigning a PROFINET device name

Proceed as follows to assign the PROFINET device name:

1. Select [Ethernet]/[Edit Ethernet node ...] from the [Target system] menu in STEP 7 HW Config.

   The following window opens:



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[1] [Browse...] button
[2] "IP address" edit box
[3] "Subnet mask" edit box
[4] "Router address" edit box
[5] "Assign IP configuration" button
[6] "Device name" edit box
[7] "Assign name" button
[8] [Close] button

2. Click the [Browse...] [1] button in the "Ethernet node " group. You receive an overview of all PROFINET IO nodes that you can reach online with your configuration tool.

   In addition, you can use the flash test to visually locate the nodes. For more information, refer to section "Status LED in PROFINET operation".

3. Choose the required node.

The SEW node appears under device type. Assign an appropriate device name. Several SEW controllers can be differentiated by the displayed MAC addresses. The MAC address is affixed to the SEW controller.

4. Enter the device name in the "Device name" edit box [6] and click the [Assign name] button [7].

   The device name can have up to 255 characters. The characters "." (dot) and "_" (underscore) are not permitted. The device name is transmitted to and saved by the node.

   You can reset the device name of the SEW controller online using the [Reset] button. You will then have to restart the SEW controller.

5. Specify an IP address [2] and a subnet mask [3] as well as a router address [4], if required.

   Click the [Assign IP configuration] button [5].

INFORMATION

The IO controller must not yet be in a cyclic data exchange with the IO devices.

6. Check whether the settings have been applied by clicking the [Browse] button [1] again.
7. Click the [Close] button [8].

10.3 Configuring the PROFINET interface for the UHX71B-OSR71B controller

10.3.1 Creating a new project

Proceed as follows to create a new project:

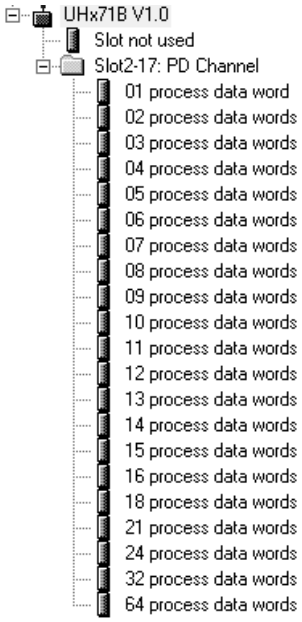
1. Start the SIMATIC Manager and create a new project.

   Select your control type and add the required modules. The following modules make sense:

   - **OB82 module:** This module makes sure that the controller does not trigger "STOP" in the event of so-called diagnostic alarms.
   - **OB86 module:** This module indicates the failure of decentralized peripherals.
   - **OB122 module:** This module is called if the controller cannot access data of a node of the decentralized periphery. This can occur, for example, when the UHX71B-OSR71B controller is ready for operation later than the controller.

2. Start STEP 7 HW Config and select the PROFINET IO slot in the control rack.
3. Add a PROFINET IO system by right-clicking the context menu with your mouse.
4. Specify an IP address for the PROFINET IO controller when doing this.
5. Add a new PROFINET subsystem by clicking the [ETHERNET] button.
6. Open [PROFINET IO] / [Additional Field Devices] / [Drives] / [SEW] / [Controller] in the hardware catalog.
7. Move the entry "UHX71B V1.0" to the PROFINET IO system with the mouse and assign a PROFINET station name. This name must correspond to the PROFINET device name specified in the UHX71B-OSR71B controller.
8. Enter the IO and periphery addresses in slot 2 and save the configuration.

The slot model is used for configuration with PROFINET. Each slot is assigned to a controller fieldbus interface. The following structure is used:



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Do not modify the default configuration "Slot not used". Slot 1 is reserved for future PROFIsafe applications.

Slots 2 – 17 can be assigned process data channels. The maximum process data width is 64 words.

9. Expand your user program by data exchange with the new units. Process data transfer is consistent. SFC14 and SFC15 can be used to transfer process data.

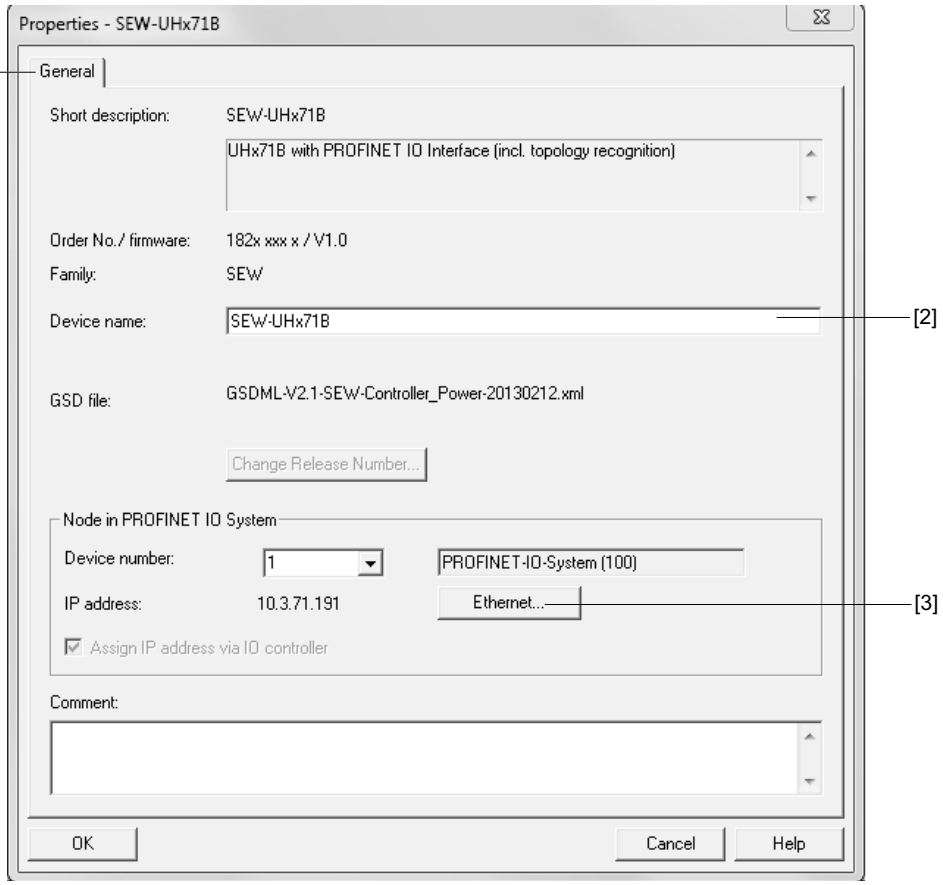
10.3.2 Configuring a node

Once the individual slots are configured, further settings have to be made for the new node.

Proceed as follows to configure a node:

1. Double-click on the device symbol of the new node.

   The following window opens:



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[1] "General" tab
[2] "Device name" edit box
[3] [ETHERNET] button

2. Enter the device name mentioned above in the "Device name" edit box [2] on the "General" tab.

   Note that the name is case-sensitive.

3. Click on the [ETHERNET] button [3] in the "Station/PN IO system" group in order to enter the previously assigned IP address.

10.4 PROFINET configuration with topology detection

10.4.1 Introduction

PROFINET topology detection allows for configuring and monitoring the structure of the network with the PROFINET IO controller in addition to the PROFINET IO devices.

The so-called "Physical device (PHDEV)" is the starting point for configuration. PDEV is a model for the Ethernet interface and can be found in slot 0 in the configuration with an "Ethernet interface" subslot and one subslot for each Ethernet port.

The Ethernet ports made visible in this way can be connected to the configuration tool. The result is an image of the desired Ethernet routing for the plant. This image is stored in the PROFINET IO controller.

To determine the real plant topology, the PROFINET IO devices must support the so-called LLDP (Link Layer Discovery Protocol). The PROFINET IO devices exchange information with the neighboring PROFINET IO devices via LLDP. Via LLDP, each PROFINET IO device cyclically sends information using its own PROFINET device name and port number. The neighboring unit receives and stores this information. A PROFINET IO controller can now read the stored information from the PROFINET IO devices and determine the real plant topology.

By comparing the configured topology with the real topology, you can detect any missing or incorrectly wired PROFINET IO devices and localize them in the plant.

Apart from cabling you can still determine the transmission characteristics for the ports. For example, you can set an "Auto-negotiation" port to "100 Mbit full duplex". The settings will be monitored.

SNMP as a protocol for network diagnostics extends the topology detection by standard diagnostics mechanisms from the IT area.

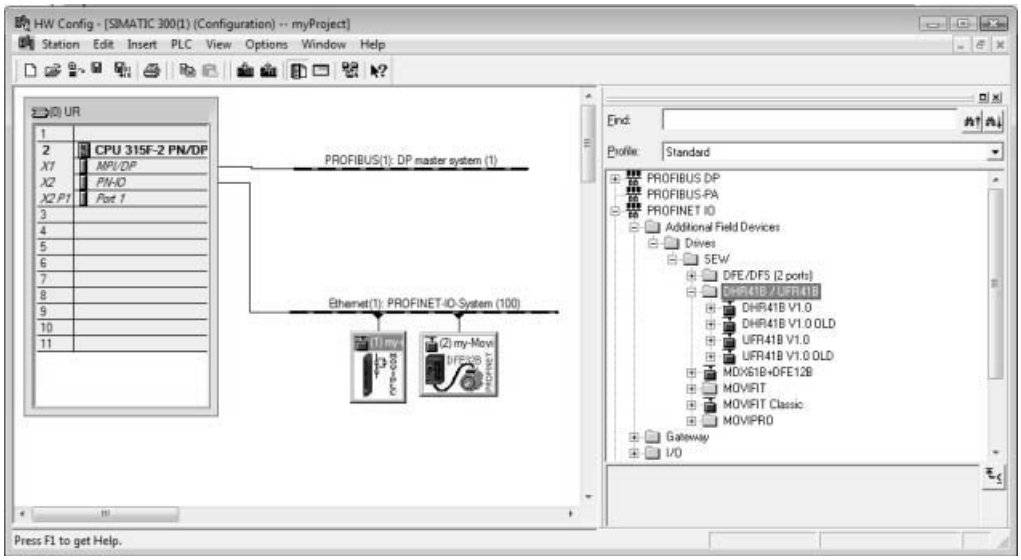
10.4.2 Creating a PROFINET IO project and starting the topology editor

The following section describes the configuration procedure for a PROFINET topology with the SIMATIC STEP 7 topology editor. Configuration can be performed in different ways in SIMATIC STEP 7. This example will focus on one approach.

1. In STEP 7 HW Config, import the PROFINET IO devices from the hardware catalog into the PROFINET IO network as usual.

   Make sure that the PROFINET IO controller supports topology detection. The controller manufacturer will provide according information.

The hardware catalog contains several entries for each SEW interface marked as different versions. An entry marked with "OLD" does not support the PROFINET IO topology detection.



7975727371

2. Right-click on "PROFINET IO system" and select "PROFINET IO topology" from the context menu to open the topology editor.

   The "Topology editor" window is displayed.

3. Proceed according to chapter "Specifying the topology".

10.4.3 Specifying the topology and detecting faulty connections

Topology detection with topology editor

The purpose of topology detection is to compare the current topology (online topology) with the configured topology (offline topology). Any deviation suggests faulty connections in the PROFINET network.

The following section provides an introduction as to how to use the topology editor to specify PROFINET nodes and detect faulty connections to ports.

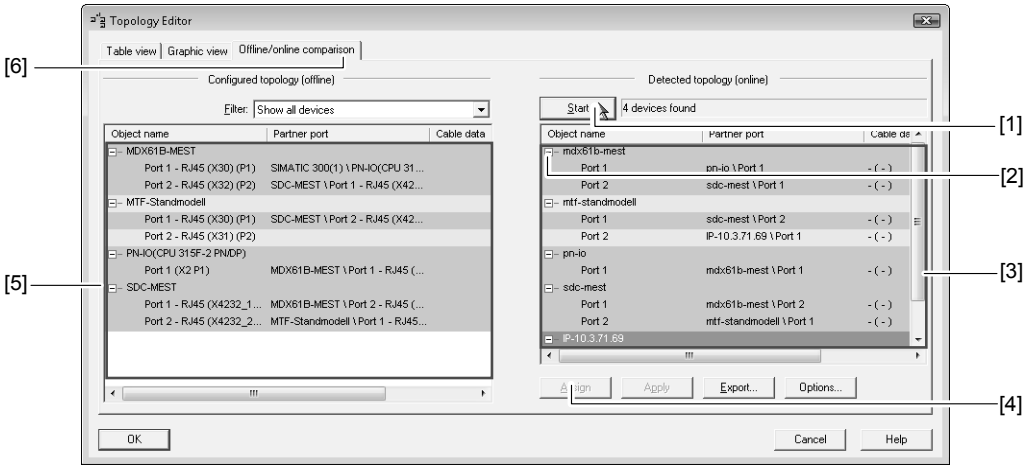
Refer to the online help for a detailed description and important additional information (e.g. the color code of the comparison results).

Click [Help] to open the online help in the open topology editor.

Specifying the topology

Proceed as follows to specify the topology of nodes in a PROFINET network:

1. Start the topology editor according to section "Creating a PROFINET project and starting the topology editor".
2. Select the "Offline/online comparison" tab [6].



9007200652515339

[1] [Start] button
[2] Plus symbol/minus symbol
[3] "Online topology" list
[4] [Assign] button
[5] "Offline topology" list
[6] "Offline/online comparison" tab

3. Click [Start] [1] to determine the online topology and compare it with the configured topology (offline topology).

   The left part of the window displays the "Configured topology (offline)" list [5] and the right part displays the "Detected topology (online)" list [3].

   The color code (the online help) and the order of the entries provide information regarding the comparison result.

4. Make sure that the assignment corresponds to your requirements and is applied to the configuration.

   - If required, change the assignment of the devices. To do so, select the respective device in both lists and click [Assign] [4].

5. Make sure that the connection of the partner ports corresponds to your requirements and is applied to the configuration.

   - Click the plus sign [2] in front of the respective device in the right part of the window (online topology) [3] to display the partner ports.
   - Change the connection of the partner ports if required. To do so, select the respective port and choose [Apply port connection] from the context menu (right-click).

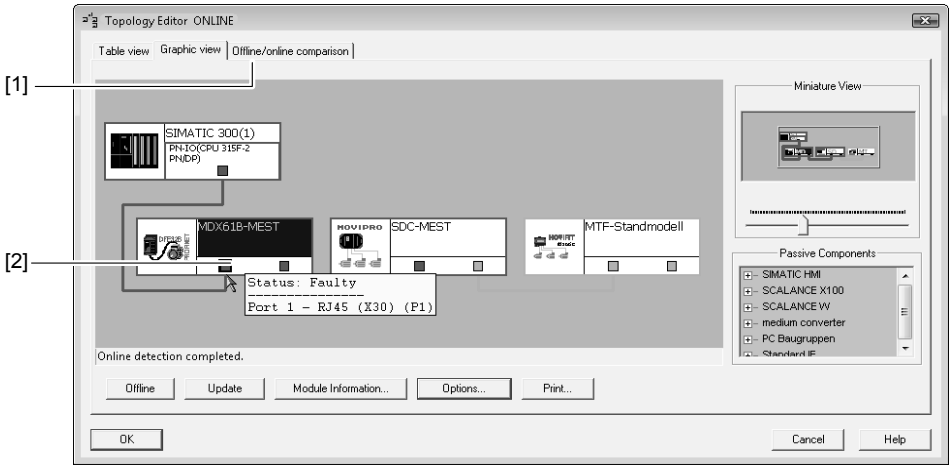
     To disconnect port connections, mark the respective port in the left part of the window and select [Interrupt port connection].
   - Repeat the procedure until all ports in the list are marked "green".

Detecting faulty connections

Faulty connections can be detected in the graphic view of the topology editor.

Proceed as follows to switch to the graphic view:

1. Start the topology editor according to section "Creating a PROFINET project and starting the topology editor".
2. Select the "graphic view" tab [1].



2379075979

[1] "Graphic view" tab
[2] Port with faulty connection

The graphic view provides a clear display of your PROFINET network (offline or online) with all devices and connected ports.

Faulty connections between ports are indicated by red lines.

3. Move the cursor over the port with the faulty connection [2] to display a status message for the error.

   The example illustrates a faulty connection between the controller and "port 1" of the first device. The faulty connection is indicated by a red connection line and the status message to the port.

10.4.4 Changing port properties

The two Ethernet ports of the PROFINET interface are set to "Automatic setup" by default. Observe the following for this default setup:

- Auto-negotiation and auto-crossover are activated in this setup.
- Baud rate and duplex mode are configured automatically.
- The neighboring port must also be set to "Automatic setup".
- You can use patch or crossover cables.

You can set a port to "100 Mbit/s full duplex". Observe the following for this setup:

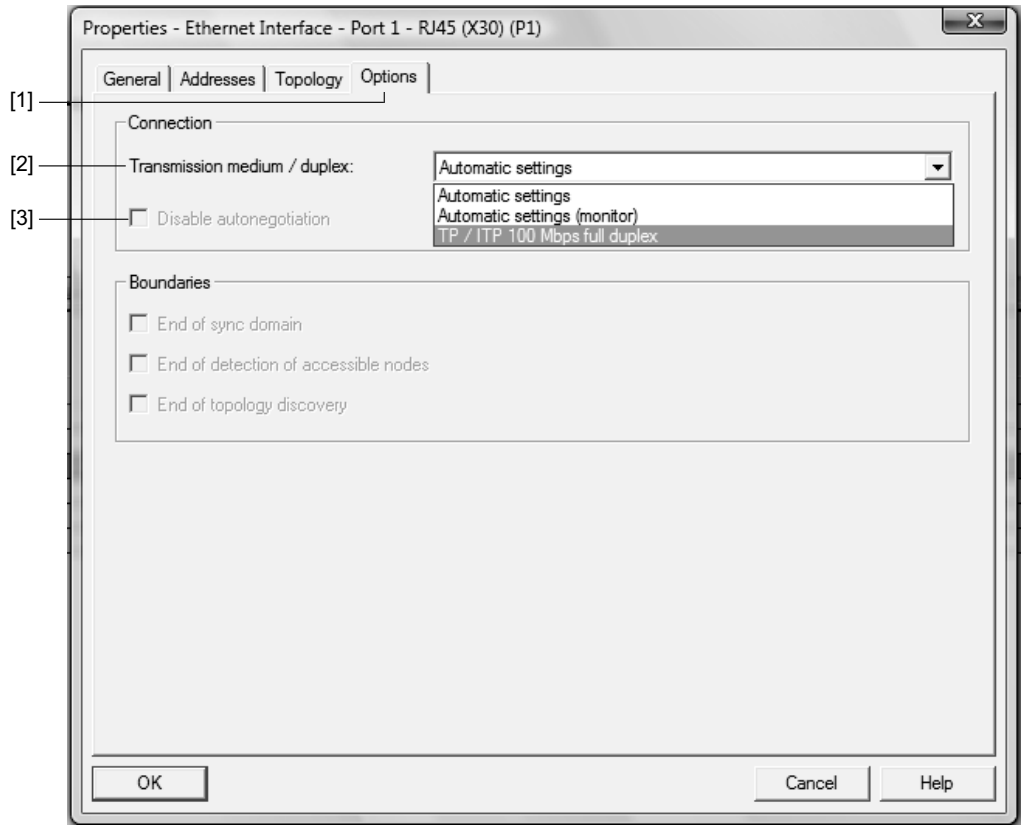
- This setting must also be made for the port of the neighboring unit, otherwise it would work with 100 Mbit/s half duplex.
- If auto-crossover is deactivated, you have to use cross cables.

Proceed as follows to set a port to "100 Mbit/s full duplex":

1. Select a unit in STEP 7 HW Config.
2. Select the desired port on slot 0.
3. Right-click on the port and select "Object properties" from the context menu.

   A window is displayed.

4. Select the "Options" tab [1].



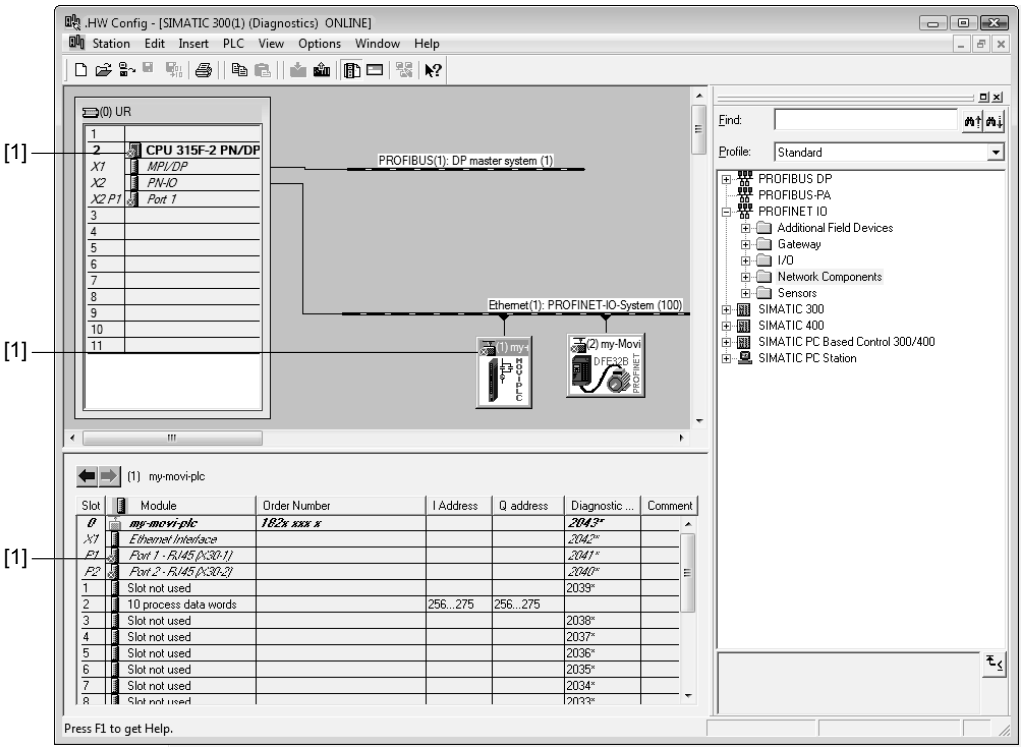
7975898507

[1] "Options" tab
[2] "Transmission medium/duplex" drop-down menu
[3] "Auto-negotiation/auto-crossover" checkbox

5. From the "Transmission medium/duplex" [2] drop-down menu select "TP/ITP with 100 Mbit/s full duplex".
6. Deactivate "Auto-negotiation/auto-crossover" checkbox [3].

10.4.5 Topology diagnostics

Topology errors are reported to the PROFINET IO controller as diagnostics alarms. In the event of an error, the EXTF-LED of the PROFINET IO controller is lit. The error is also indicated by a red cross [1] in STEP 7 HW Config.



7975757451

[1] "Red cross" – symbol for errors

Possible causes:

- Ethernet ports swapped
- Incorrectly set port properties
- Units cannot be addressed

Proceed as follows to display information about an error:

1. Select the unit or the respective slot.
2. Right-click and select "Module status" from the context menu.

   A window is displayed.
3. Select the "Communication diagnostics" tab.

10.4.6 Port statistics

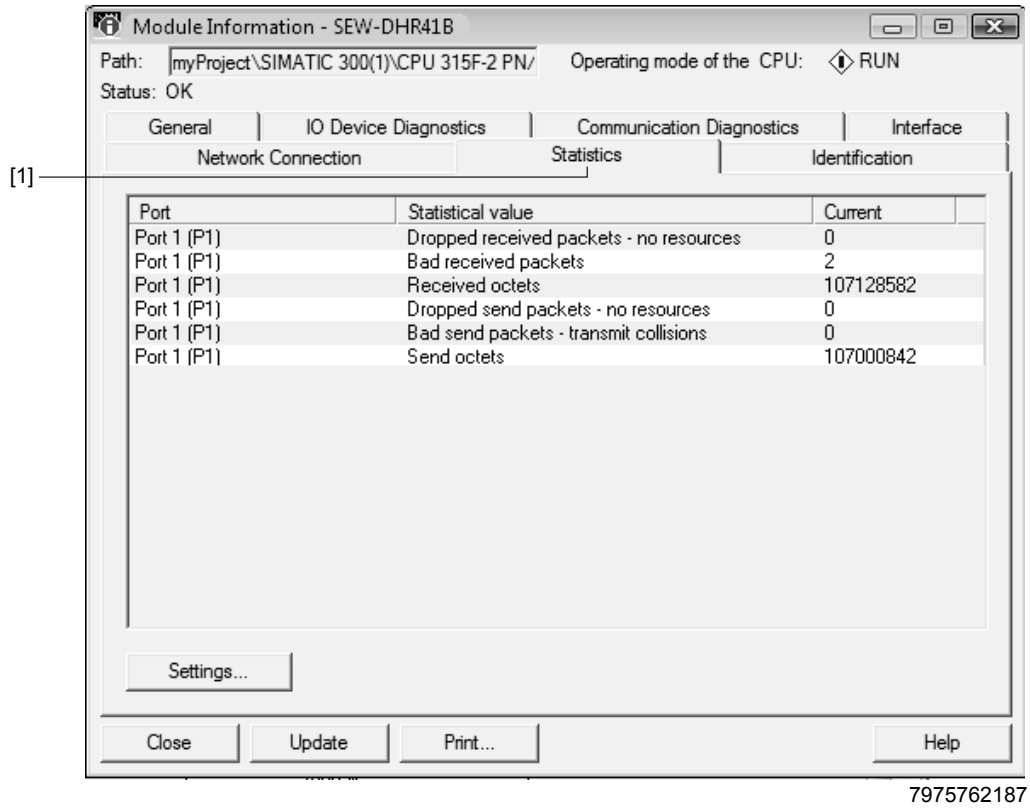
Proceed as follows to display the port statistics for an Ethernet port in STEP 7 HW Config:

1. Click the "ONLINE ↔ OFFLINE" symbol, to switch to "online" communication mode.
2. Select a unit.
3. Select the desired port on slot 0.
4. Right-click and select "Module status" from the context menu.

   A window is displayed.

   Select the "Statistics" tab [1].

   The following view is displayed:



7975762187

[1] "Statistics" tab

The following statistic values can be displayed:

- **Dropped received packets – no resources** Shows the number of valid Ethernet packets discarded upon reception. A large number of discarded valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by reducing in particular the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line if required.
- **Bad received packets** Shows the number of faulty Ethernet packets. A high number suggests a bus error. In this case, check the cabling and shielding of the network.
- **Received octets** Shows the number of received packets.
- **Dropped sent packets – no resource** Shows the number of valid Ethernet packets discarded during transmission. A large number of discarded valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by reducing in particular the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line if required.

- **Bad sent packets – transmit collisions** Shows the number of discarded Ethernet packets due to collisions. There should be no collisions in a switched network.
- **Sent Octets** shows the number of transmitted packets.

11 Operating Behavior on PROFINET IO

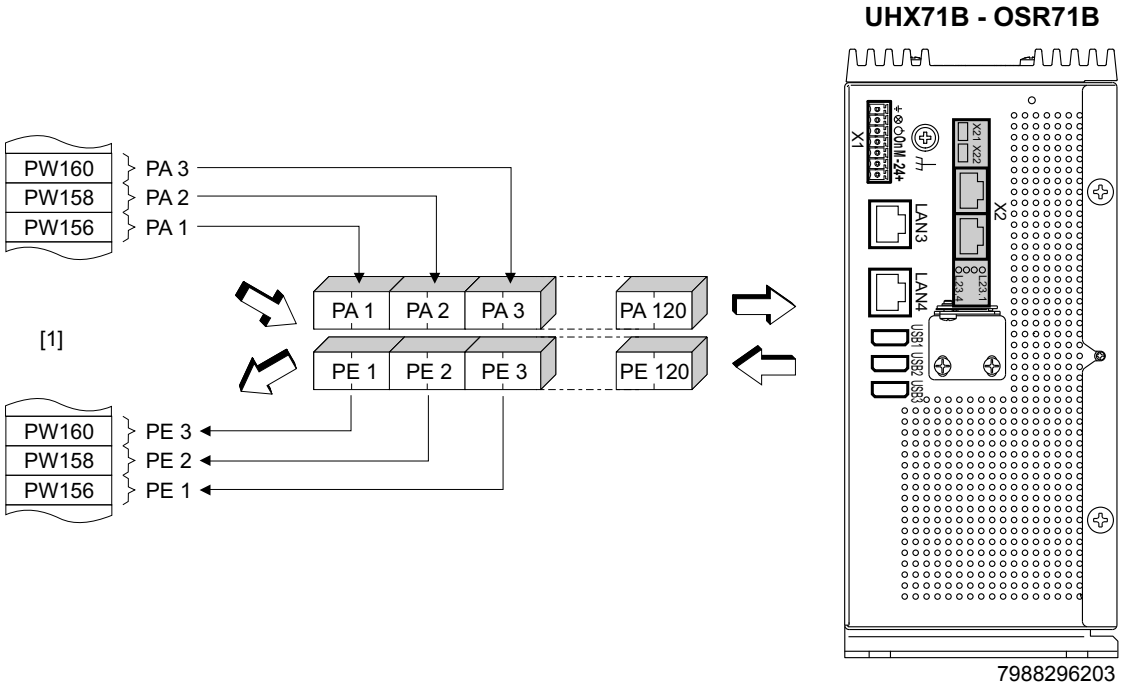
This chapter describes the basic characteristics of the UHX71B-OSR71B controller connected to the PROFIBUS system.

11.1 Process data exchange with the SEW controller

This chapter illustrates the basic behavior of the SEW controllers on the PROFINET fieldbus system.

The drive SEW controllers are controlled via the process data channel which is up to 120 I/O process input and output words in length.

These process data words are mapped in the I/O or peripheral area when a higher-level programmable logic controller is used as PROFINET IO controller, and can thus be addressed in the usual way.



[1] Address range of the higher-level PLC
PI1 – PI120 Process input data
PO1 – PO120 Process output data

11.1.1 Control example for SIMATIC S7

Depending on the selected process data configuration, the process data exchange with SEW controller via SIMATIC S7 is carried out via special system functions

- *SFC14 DPRD_DAT* and
- *SFC15 DPWR_DAT*

STEP 7 program example

In this example, the SEW controller is configured with the process data configuration *10 PD* to the input addresses PIW512... and output addresses POW512... .

A data block DB3 is created with about 50 data words.

When SFC14 is called, the process input data is copied to data block DB3, data words 0 to 18. When SFC15 is called after the control program has been processed, the process output data is copied from data words 20 – 38 to the output address POW 512....

Note the length specification in bytes for the *RECORD* parameter. The length information must correspond to the configured length.

Refer to the online help for STEP 7 for detailed information about the system functions.

```
//Start of cyclical program processing in OB1
BEGIN
NETWORK
TITLE = Copy PI data from the DHR41B control card to DB3, words 0...18
CALL SFC  14 (DPRD_DAT)          //Read DP Slave Record
LADDR  := W#16#200          //Input address 512
RET_VAL:= MW 30             //Result in flag word 30
RECORD := P#DB3.DBX 0.0 BYTE 20 //Pointer
NETWORK
TITLE =PLC program with drive application
// PLC program uses the process data in DB3 for data exchange
// with the DHR41B control card
L  DB3.DBW 0     //Load PI1
L  DB3.DBW 2     //Load PI2
L  DB3.DBW 4     //Load PI3
// etc.
L  W#16#0006
T DB3.DBW 20     //Write 6hex to PO1
L  1500
T  DB3.DBW 22     //Write 1500dec to PO2
L  W#16#0000
T  DB3.DBW 24     //Write 0 hex to PO3
// etc.
NETWORK
TITLE = Copy PO data from DB3, words 20...38 to the DHR41B control
card
CALL SFC  15 (DPWR_DAT)            //Write DP slave record
LADDR  := W#16#200            //Output address 512 = 200 hex
RECORD := P#DB3.DBX 20.0 BYTE 20            //Pointer to DB/DW
RET_VAL:= MW 32            //Result in flag word 32
```

INFORMATION

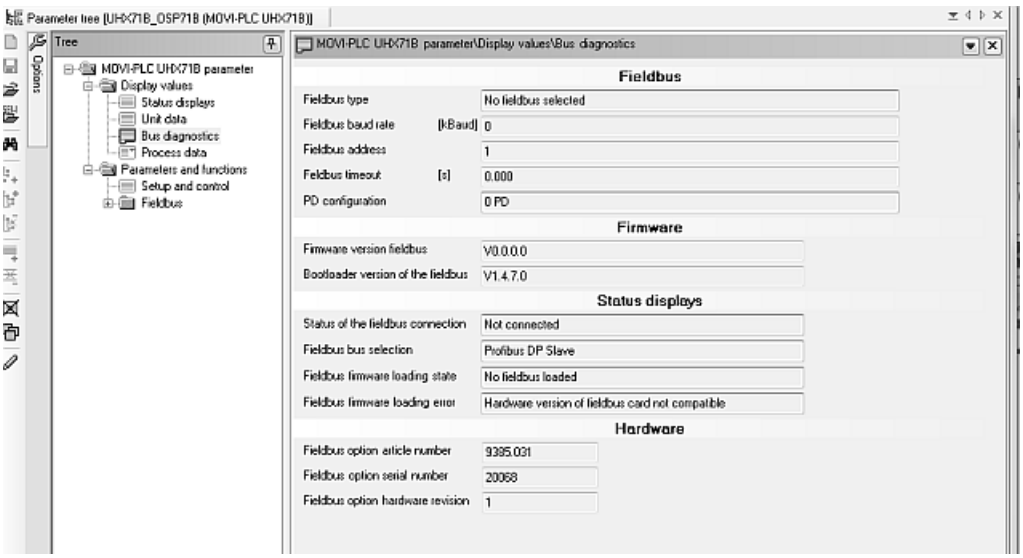
- This program example is a special and free service that demonstrates only the basic principles of generating a PLC program as a non-binding sample. SEW is not liable for the contents of the sample program.
- For S7 sample projects, refer to the "Software" section on the SEW website.

11.2 Settings in the UHX71B-OSR71B controller

The creation of IEC programs is described in detail in the "MultiMotion for MOVI-PLC®" manual. This is why only the fieldbus-specific characteristics are described in this chapter.

11.2.1 Process data configuration of the PROFINET slave

The configuration of the process data interface is performed by the fieldbus master. It sets the number of process data words and the timeout interval. For information regarding the current settings, refer to the parameter tree in MOVITOOLS® MotionStudio via menu [Display values] / [Bus diagnostics].



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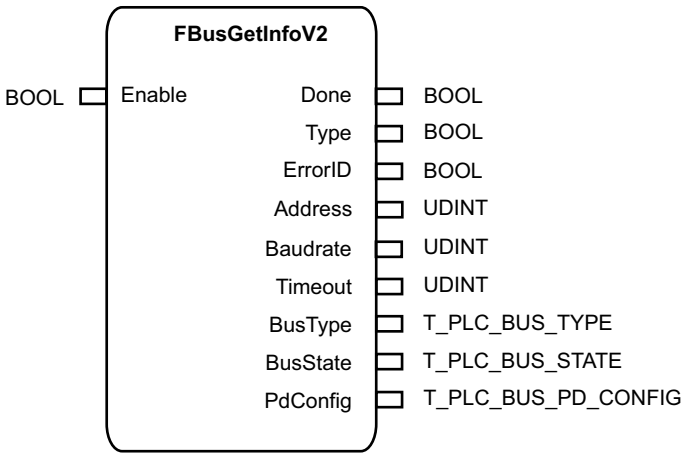
11.2.2 Status of the PROFINET fieldbus interface

The *FbusGetInfoV2* function block makes the status and some display parameters of the fieldbus interface available for the IEC program and for diagnostics.



7628791563

If there is no communication with the fieldbus master, the output *Error* is set to *TRUE*. During an active fieldbus connection, the output *Done* is set to *TRUE*, and the outputs *Address*, *Baud rate*, *timeout* and *Bus type* show the respective parameters as they were set via the parameter tree in MOVITOOLS® MotionStudio or via PLC.

11.2.3 Checking the process data communication

Now actual values can be read from the UHX71B-OSR71B controller and setpoint values can be written. The process data should correspond with the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio.

INFORMATION

For more detailed information on process data communication in the IEC program, refer to the publication "MultiMotion for MOVI-PLC®".

12 Error Diagnostics on PROFINET

12.1 Diagnostic procedures

The diagnostics procedures described in the following section demonstrate the error analysis methods for the most frequent problems:

- The UHX71B-OSR71B controller does not work on PROFINET IO
- The UHX71B-OSR71B controller cannot be controlled using the IO controller

INFORMATION

For further information on the programming of the UHX71B-OSR71B controller, refer to the publication "MultiMotion for MOVI-PLC®".

12.1.1 Diagnostic problem 1: UHX71B-OSR71B does not work on PROFINET IO

Initial status:
- UHX71B-OSR71B is physically connected to PROFINET IO
- UHX71B-OSR71B has been configured in the IO controller and bus communication is active

↓

Ethernet bus connector X21, X22 plugged in? — No → **[A]**

Yes ↓

Response of the Link LED? — OFF → [B]

Green ↓

UHX71B-OSR71B has no connection to Ethernet.

↓

Compare the set PROFINET name to the configured one.

↓

PROFINET names identical? — No → **[C]**

Yes ↓

You may have configured an incorrect unit type or defined an incorrect configuration.

↓

Delete configuration for the UHX71B-OSR71B option from the PROFINET IO network.

↓

Configure the UHX71B-OSR71B option again, selecting the unit designation "UHX". Assign the address ranges for your control system.

↓

Load the configuration data into the PROFIBUS IO controller master and restart the bus communication.

Yes ↓

Response of the BUS FAULT LED? — Red → **[B]**

Off ↓

UHX71B-OSR71B has no connection to Ethernet.

↓

Compare the set PROFINET name to the configured one.

↓

PROFINET names identical? — No → **[C]**

Yes ↓

You may have configured an incorrect unit type or defined an incorrect configuration.

↓

Delete configuration for the UHX71B-OSR71B option from the PROFINET IO network.

↓

Configure the UHX71B-OSR71B option again, selecting the unit designation "UHX". Assign the address ranges for your control system.

↓

Load the configuration data into the PROFIBUS IO controller master and restart the bus communication.

[A]	Check the bus cabling.
[B]	The UHX71B-OSR71B option indicates that the PROFINET IO controller has not yet established communication.
	↓
	The PROFINET IO controller is switched off or has not yet been started up.
[C]	Adapt PROFINET names

12.1.2 Diagnostic problem 2: No process data exchange with the I/O controller

- Check the settings in the higher-level I/O controller again.

  Is the user program switched off correctly? (see sample program in chapter "Process data exchange with the UHX71B-OSR71B controller")
- Check the settings on the UHX71B-OSR71B controller (see chapter "Settings on the UHX71B-OSR71B controller")

13 Appendix

13.1 Overview of parameters

The following tables show the assignment of MOVILINK® indexes to the respective fieldbus option.

The following abbreviations are used:

Fieldbus	Abbreviation
PROFIBUS	PB
PROFINET	PN
EtherNet/IP	EP
Modbus/TCP	MB

13.1.1 Bus independent parameters

MOVILINK®		Meaning
Index	Subindex	
8451	0	Process data configuration (Modbus/TCP: always120 process data words)
8452	0	Fieldbus type
8362	0	Option 1
10497	1	Fieldbus timeout For Modbus/TCP, additonal timeout monitoring is necessary according to the application.
10530	1	Item number
10530	2	Serial number
10530	3	Fieldbus version 1 (2 ×16 bits: major/minor)
10530	4	Fieldbus version 2 (2 ×16 bits: revision/build)
10530	5	Firmware load state
10530	6	Firmware load error
10530	7	Fieldbus selection
10530	8	Bootloader version 1
10530	9	Bootloader version 2
10530	10	Hardware revision
15800.0 – 15863.0 15864.1 – 15864.56		Process data IN (PO)
15900.0 – 15963.0 15964.1 – 15964.56		Process data OUT (PI)

13.1.2 Bus dependent parameters

MOVILINK®		Meaning	PB	PN	EP	MB
Index	Subindex					
8606	0	Fieldbus timeout		x	x	x
8454	0	Profibus address	x			
8453	0	Fieldbus baud rate	x			
10520	1	ACD Enable			x	
10520	2	ACD Last Activity			x	
10520	3	ACD Last MAC Low			x	
10520	4	ACD Last MAC High			x	
10520	5	ACD Last IP			x	
9233	0	DHCP startup control			x	x
8992	0	IP address			x	x
8993	0	Subnet mask		x	x	x
8994	0	Default gateway		x	x	x
8995	0	MAC Address Low		x	x	x
8996	0	MAC Address High		x	x	x
8997	0	Ethernet baud rate		x	x	x
10093	Blob	PROFINET device name		x		

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